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For related information see also *Astronautics*.

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For related information see also *34 Fluid Mechanics and Heat Transfer*.

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Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION N.A.
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) 127

89 ASTRONOMY 127
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 129
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 130
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS 130
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 131
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL 131

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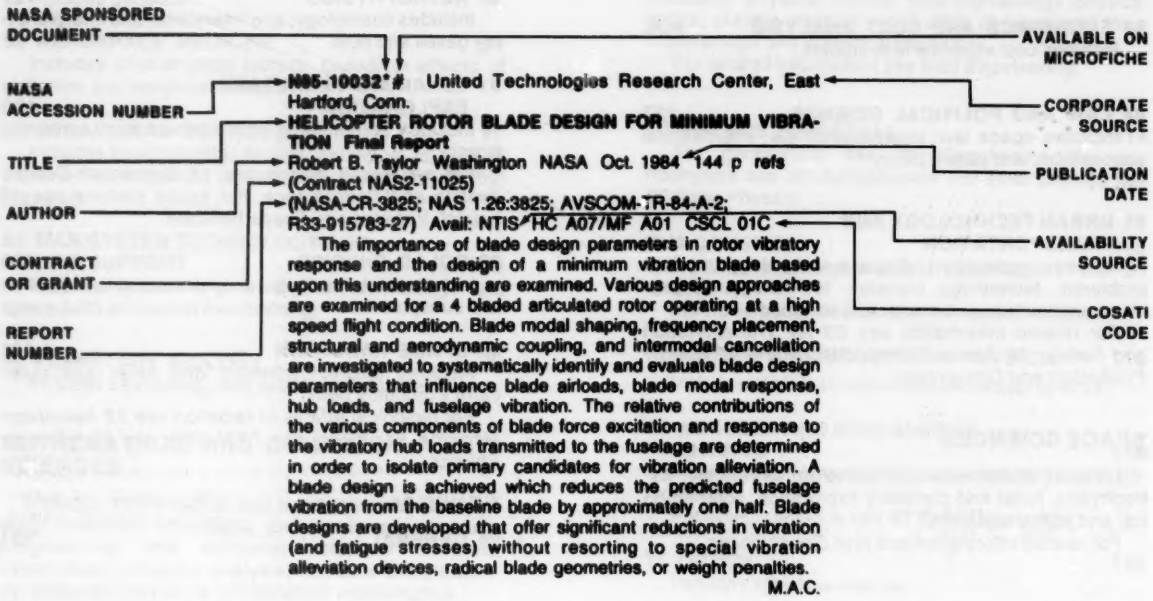
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N85-10032*# United Technologies Research Center, East Hartford, Conn.
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HELICOPTER ROTOR BLADE DESIGN FOR MINIMUM VIBRATION Final Report
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Robert B. Taylor Washington NASA Oct. 1984 144 p refs
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The importance of blade design parameters in rotor vibratory response and the design of a minimum vibration blade based upon this understanding are examined. Various design approaches are examined for a 4 bladed articulated rotor operating at a high speed flight condition. Blade modal shaping, frequency placement, structural and aerodynamic coupling, and intermodal cancellation are investigated to systematically identify and evaluate blade design parameters that influence blade airloads, blade modal response, hub loads, and fuselage vibration. The relative contributions of the various components of blade force excitation and response to the vibratory hub loads transmitted to the fuselage are determined in order to isolate primary candidates for vibration alleviation. A blade design is achieved which reduces the predicted fuselage vibration from the baseline blade by approximately one half. Blade designs are developed that offer significant reductions in vibration (and fatigue stresses) without resorting to special vibration alleviation devices, radical blade geometries, or weight penalties.
M.A.C.

VOLUME 23 NUMBER 1 / JANUARY 8, 1985

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N85-10001*# National Academy of Sciences - National Research Council, Washington, D. C.
AERONAUTICS TECHNOLOGY POSSIBILITIES FOR 2000: REPORT OF A WORKSHOP
Oct. 1984 241 p refs Workshop held in Austin, Tex., Jan. 1984 (Contract NASw-3455)
(NASA-CR-174018; NAS 1.26:174018) Avail: NTIS HC A11/MF A01 CSCL 01B

The potential of aeronautical research and technology (R&T) development, which could provide the basis for facility planning and long range guidance of R&T programs and could establish justification for support of aeronautical research and technology was studied. The projections served specific purposes: (1) to provide a base for research and future facilities needed to support the projected technologies, and development advanced vehicles; (2) to provide insight on the possible state of the art in aeronautical technology by the year 2000 for civil and military planners of air vehicles and systems. Topics discussed include: aerodynamics; propulsion; structures; materials; guidance, navigation and control; computer and information technology; human factors; and systems integration. E.A.K.

N85-10002# Aeronautical Systems Div., Wright-Patterson AFB, Ohio. Directorate of Support Systems Engineering.
AERONAUTICAL SYSTEMS TECHNOLOGY NEEDS: ESCAPE, RESCUE AND SURVIVAL, TEST FACILITIES AND TEST EQUIPMENT AND TRAINING-SIMULATION EQUIPMENT Annual Report, Jan. 1983 - Jan. 1984
D. C. Kittinger Apr. 1984 68 p
(AD-A145059; ASD/(ENE)-TR-84-5003; ASD-TR-5006) Avail: NTIS HC A04/MF A01 CSCL 01/3

This report is part of a compilation of formalized Technology Needs (TNs) covering Support Systems as identified in the Aeronautical Systems Division. They are based on development/operational experience, systems studies, and new concepts -- all related to future system applications. Their presentation is to serve a threefold purpose: (1) guidance for technology programs, (2) prove developmental potential, and (3) engineering data/requirements essential for technology use in systems. The identified needs delineate progress desired in performance, control, design flexibility, safety and cost. GRA

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N85-10003# Weapons Systems Research Lab., Salisbury (Australia).
WIND TUNNEL TESTS ON A TUBE-LAUNCHED MISSILE CONFIGURATION WITH A DEFLECTABLE NOSE CONTROL AND A NOVEL WRAP-AROUND FIN STABILISER
K. D. Thomson Aug. 1983 35 p refs
(AR-003-696; WSRL-0327-TR) Avail: NTIS HC A03/MF A01

The Mach number range 0.80 to 2.00 on a tube launched missile configuration with a deflectable nose control and a wrap around fin stabilizer with six fans disposed in a symmetrical triform arrangement were examined. It is shown that the control effectiveness increases markedly with Mach number. Trim curves are nonlinear at subsonic speeds and approach linearity at supersonic Mach numbers. A missile configuration indicates that the nose control is powerful enough to provide a terminal control capability. In subsonic flight the missile must fly on a near ballistic trajectory. In supersonic flight the control is powerful enough to permit horizontal flight above M = 1.5 while retaining a sufficient reserve to provide a terminal correction capability. E.A.K.

N85-10004# National Aeronautical Establishment, Ottawa (Ontario). High Speed Aerodynamics Lab.
AN EXPERIMENTAL STUDY OF THE TRANSONIC EQUIVALENCE RULE WITH LIFT, PART 2
Y. Y. Chan Mar. 1984 45 p refs Previously announced as N82-33350
(AR-LR-614-Pt-2; NRC-23412-Pt-2) Avail: NTIS HC A03/MF HC A03/MF A01

The transonic equivalence rule with lift has been studied experimentally. Under the conditions defined by the rule, wing-body models with the same cross-sectional area distribution but with wings of different aspect ratios and thicknesses were tested at transonic speeds. The correlations of the lift depending wave drag and the lift parameter for the models are found to be similar. The similitude of the outer flow field under the same lifting condition is also established. The drag-rise of the equivalent body of revolution with the cross-sectional area distribution including that due to lift correlates well with those of the wing-body models at the design lift condition. The experiment therefore verifies the transonic equivalence rule at lifting condition. Author

N85-10005# National Inst. for Aeronautics and Systems Technology, Pretoria (South Africa). Aeronautics Dept.
THREE DEGREE OF FREEDOM STEADY STATE POINT PERFORMANCE PROGRAM: UPDATED VERSION 1
B. Wigdorowitz Jun. 1983 336 p
(CSIR-NIAST-83/48; ISBN-0-7988-2691-6) Avail: NTIS HC A15/MF A01

A computer program was written in FORTRAN 5 for the computation of the three DOF steady state point performance of an aircraft. The input data consists of thrust, C sub L, C sub D and C sub Y coefficients either in table or equation form and the output is dependent on the user specifications. Author

N85-10006# National Inst. for Aeronautics and Systems Technology, Pretoria (South Africa).

IMPLEMENTATION OF THE SUPERSONIC TRIPLET SINGULARITY INTO THE USTORE COMPUTER CODE

G. J. VandenBroek May 1983 30 p refs
(CSIR-NIAST-83/47; ISBN-0-7988-2686-X) Avail: NTIS HC A03/MF A01

The development of the supersonic triplet singularity to alleviate interior wave propagation problems experienced with a constant source surface panel singularity distribution on bodies in supersonic flow is discussed. The applicability of the triplet is investigated. It is found that the triplet singularity works well for isolated bodies of revolution with axisymmetric panelling. The triplets are generally not effective in dealing with non-axisymmetry effects and interference effects. Author

N85-10007*# Boeing Commercial Airplane Co., Seattle, Wash.

DEVELOPMENT AND APPLICATIONS OF ALGORITHMS FOR CALCULATING THE TRANSONIC FLOW ABOUT HARMONICALLY OSCILLATING WINGS

F. E. Ehlers, W. H. Weatherill, and E. L. Yip Oct. 1984 152 p refs
(Contract NAS1-16297)
(NASA-CR-172376; NAS 1.26:172376) Avail: NTIS HC A08/MF A01 CSCL 01A

A finite difference method to solve the unsteady transonic flow about harmonically oscillating wings was investigated. The procedure is based on separating the velocity potential into steady and unsteady parts and linearizing the resulting unsteady differential equation for small disturbances. The differential equation for the unsteady velocity potential is linear with spatially varying coefficients and with the time variable eliminated by assuming harmonic motion. An alternating direction implicit procedure was investigated, and a pilot program was developed for both two and three dimensional wings. This program provides a relatively efficient relaxation solution without previously encountered solution instability problems. Pressure distributions for two rectangular wings are calculated. Conjugate gradient techniques were developed for the asymmetric, indefinite problem. The conjugate gradient procedure is evaluated for applications to the unsteady transonic problem. Different equations for the alternating direction procedure are derived using a coordinate transformation for swept and tapered wing planforms. Pressure distributions for swept, untaped wings of vanishing thickness are correlated with linear results for sweep angles up to 45 degrees. E.A.K.

N85-10008*# National Aeronautics and Space Administration, Washington, D. C.

ON VORTEX BURSTING

H. Werle Jun. 1984 67 p refs Transl. into ENGLISH of "Sur l'eclatement des tourbillons" rept. ONERA-NT-175 France, 1971 50 p Translation previously announced as N72-19328 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prepared by ONERA, France
(Contract NASw-3541)
(NASA-TM-77587; NAS 1.15:77587; ONERA-NT-175) Avail: NTIS HC A04/MF A01 CSCL 01A

Vortex bursting is studied by means of visualization. The physical behavior of the phenomenon is emphasized, and its similarity with boundary layer separation or wake bursting becomes apparent. The essential influence of an increasing pressure gradient on the initiation, the position and the type of bursting is clearly confirmed. The evolution of the phenomena as a function of several parameters is analyzed in the case of delta wings, alone or installed on aircraft models, and compared with the results of similar wind tunnel or flight tests. M.A.C.

N85-10009# National Aerospace Lab., Tokyo (Japan). First Airframe Div.

INTEGRAL EQUATION OF LIFTING SURFACES IN LAPLACE DOMAIN AND ANALYTIC CONTINUATION OF ITS PRESSURE KERNEL

Tetsuhiko Ueda Jan. 1984 40 p refs
(NAL-TR-795T; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

The subsonic kernel of integral equations in Laplace domain relating the upwash and pressure distributions on a thin finite wing is extended to the entire s-plane by analytic continuation. An asymptotic of integral functions occurring the kernel is also presented for large variables with some numerical results. Author

N85-10010# National Aerospace Lab., Tokyo (Japan).

A STUDY OF AERODYNAMIC CHARACTERISTICS OF WING-BODY COMBINATIONS. PART 2: LOW-WING AIRPLANE

Mitsunori Yanagisawa, Kazuo Kikuchi, and Chuyu Koyama Jan. 1984 25 p refs In JAPANESE; ENGLISH summary
(NAL-TR-796; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

Experimental pressure distribution, lift, moment and drag coefficients on the wing-body combinations are measured. Data were obtained at angles of attack from -10 degree to 10 degree, a free stream velocity of 40 m/s and Reynolds numbers based upon wing chord lengths from 0.32 x 10 to the 6th power to 0.43 x 10 to the 6th power. The data obtained from these experiments are compared with data obtained from computations using a boundary element method which is a modification of Morino's theory. In order to confirm the starting points of the trailing vortex sheets on the body, observations of the flowfield by an oil flow technique are presented and the features of the oil film flow patterns are discussed. It is concluded that the present procedure may offer promise for practical engineering applications. Author

N85-10011# National Aerospace Lab., Tokyo (Japan).

OPTIMUM DESIGN OF NONPLANAR WINGS: MINIMUM INDUCED DRAG FOR A GIVEN LIFT AND WING ROOT BENDING MOMENT

Keisuke Asai Jan. 1984 23 p refs In JAPANESE; ENGLISH summary
(NAL-TR-797; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

The application of nonplanar wings such as Whitcomb's winglet to subsonic transport airplanes is discussed. A simple numerical method was developed to calculate the minimum induced drag for a wing of an arbitrary nonplanar configuration, using the Trefftz-plane (far-field) analysis and the Lagrangian multiplier technique. For a series of wing/winglet combinations and several more complex forms such as curved wings, the value of the induced drag efficiency parameter l/e is evaluated and compared with that of a conventional planar wing. When comparing the induced drag benefits, it is assumed that both wings have the same extended wing planform rather than the projected one. To take account of the trade-offs between wing aerodynamic efficiency and wing structural weight, the wing root bending moment as well as the wing total lift are kept constant. With these constraints, the drag performances for both wings could be compared without any ambiguity associated with wing structural weight and wing surface skin friction. M.G.

N85-10012# National Aerospace Lab., Tokyo (Japan).

NUMERICAL ANALYSIS OF THE 3-DIMENSIONAL INVISCID HYPERSONIC FLOW AROUND CAPSULE-TYPE BODIES BY THE ALTERNATE DIRECTIONAL IMPLICIT METHOD

Yukimitsu Yamamoto 1984 33 p refs In JAPANESE; ENGLISH summary
(NAL-TR-799; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

An alternate directional implicit algorithm for solving the unsteady Euler equations in a strong conservative form was used to compute the flow around capsule type bodies in a hypersonic free stream. Calculations of such flowfields are important in order to estimate the aerodynamic loads and heating characteristics of the reentry vehicles. Body configurations consist of nose and shoulder radius R sub 1, R sub 2 respectively and the ratio of R sub 2/R sub 1 is varied from 1.0 to 0.05. Calculations are made at free stream Mach number of 7.0 and numerical results compared with existing experimental data obtained in the hypersonic wind tunnel at National Aerospace Laboratory. Reasonable agreements for surface pressure and shock locations are shown at various angles of attack. These comparisons demonstrate the capability of the present numerical procedure for computing such three dimensional flowfields. R.J.F.

N85-10013# National Aerospace Lab., Tokyo (Japan).
SOME CONSIDERATIONS ON AEROELASTIC INSTABILITIES CAUSED BY COUPLING BETWEEN PROPELLER-TYPE ROTOR AND ITS SUPPORTING STRUCTURE
Teruo Ichikawa 1984 19 p refs In JAPANESE; ENGLISH summary
(NAL-TR-804; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

Aeroelastic instabilities caused by the coupling between a rigid rotor and a flexible tower of a horizontal axis wind turbine are considered. Equations of motion having periodic coefficients are derived with respect to the fixed frame of reference as well as the frame of reference moving with the rotor by assuming an aerodynamic force predicted by the quasi-steady blade element theory. The same equations can be applied to rotors of both downwind and upwind types. It is shown that the equations of motion with respect to an appropriate frame of reference have constant coefficients in cases where either the rotor or the tower stiffness is isotropic. Possible instabilities only in these cases are studied with the help of Routh's criterion. Three kinds of instabilities, that is, the whirl flutter and the divergences of the first and second kinds, are predicted. R.J.F.

N85-10014# National Aerospace Lab., Tokyo (Japan).
CHARACTERISTICS OF CONTROLLED-OSCILLATING ANNULAR CASCADE TEST FACILITY WITH FREON GAS
Hiroshi Kobayashi 1984 23 p refs In JAPANESE; ENGLISH summary
(NAL-TR-812; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

The trend towards ever greater mass flow or small diameter in turbomachines leads to high flow velocities and to slender blades. Therefore, it is likely that the problem of aeroelastic phenomena, namely flutter and forced vibration, will increase in significance in the fan stage of turbofan engines and the last stage of industrial turbines. To clarify aeroelastic phenomena of cascade blades, the annular test facility was designed and constructed at NAL, where all 16 blades in annular cascade can be harmonically oscillated by a mechanical oscillatory system in a torsional mode at frequencies up to 500 Hz with constant amplitude and interblade phase angle. Freon gas is used as a working fluid to simulate actual high Mach number and high reduced frequency in cascade flutter. By a series of experiments, it was made clear that this annular test facility satisfied the characteristics necessary for the study of aeroelasticity in turbomachinery at Mach numbers up to 1.4 and reduced frequencies up to 1.2. R.J.F.

N85-10015*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
INLET AND AIRFRAME COMPATIBILITY FOR A V/STOL FIGHTER/ATTACK AIRCRAFT WITH TOP-MOUNTED INLETS Final Report
D. A. Durston and D. B. Smeltzer Washington Jun. 1982 12 p refs
(NASA-TM-84252; A-8948; NAS 1.15:84252) Avail: NTIS HC A02/MF A01 CSCL 01A

Aerodynamic force and inlet pressure data are obtained for 9.5% force and pressure models of a V/STOL fighter/attack aircraft configuration with top mounted twin inlets. Data are presented from tests conducted in the Ames Unitary Wind Tunnels at Mach numbers of 0.6, 0.9, and 1.2 at angles of attack up to 27 deg. and angles of sideslip up to 12 deg. Trimmed aerodynamic characteristics and inlet performance are compared for three different leading edge extension (LEX) configurations. The effects of wing leading and trailing-edge flaps on the inlet are also determined. Maneuver performance is calculated form combined force and inlet pressure data. The largest of the three LEX sizes tested gives the best airplane maneuver performance. Wing flap deflections improved inlet recovery at all Mach numbers. M.A.C.

N85-10016# Oklahoma Univ., Norman. School of Aerospace Mechanical and Nuclear Engineering.
TURBULENT BOUNDARY LAYERS OVER ROUGH SURFACES HYPERSONIC FLOW Final Report, 1 May 1983 - 30 May 1984
J. M. Russell 30 Jun. 1984 43 p
(Grant AF-AFOSR-0186-83)
(AD-A145040; AFOSR-84-0756TR) Avail: NTIS HC A03/MF A01 CSCL 20/4

A method for predicting the downstream development of momentum thickness, skin friction, and heat transfer in a supersonic turbulent boundary layer over a rough flat plate based on ideas of Van Driest, Rotta, and Bradshaw is derived and discussed. Admissible thermal boundary conditions include the case of prescribed wall temperature and the case of an adiabatic wall. The velocity profiles for compressible nonadiabatic flow are expressed as transformations of the corresponding velocity profiles in incompressible adiabatic flow. Analytical curve fits to the experimentally determined law-of-the wall (including the sublayer region) are given, as are analytical representations of the effects of sand grain roughness based on the well known data of Nikuradse. A FORTRAN source code for implementing the method is included as are sample calculations of the momentum thickness, skin friction, and heat transfer for several roughness heights.
Author (GRA)

N85-10017# Analytical Methods, Inc., Redmond, Wash.
PREDICTION OF AERODYNAMIC CHARACTERISTICS OF FIGHTER WINGS AT HIGH ANGLES OF ATTACK Final Technical Report, 15 Apr. 1982 - 31 Mar. 1984
B. Maskew, T. S. Vaidyanathan, J. K. Nathman, and F. A. Dvorak Mar. 1984 133 p
(Contract N00014-82-C-0354)
(AD-A145107; AMI-8405) Avail: NTIS HC A07/MF A01 CSCL 20/4

Potential modeling techniques for representing separated and vortical flows are investigated with the objective being the prediction of aerodynamic characteristics of fighter wings at high angles of attack. A low-order surface singularity panel method is coupled with iterative routines for locating the force free wake and for including viscous effects and edge vortices. The viscous effects are computed using integral boundary layer procedures and the displacement effect is represented in the panel method using the transpiration model. Regions of massive separation are enclosed in free vortex sheets which are included in the general wake configuration scheme of the panel method. Calculations show encouraging results in those cases where there is little cross flow inside the separated zone. The calculations were less successful when the separated zone became highly three-dimensional, as in the case of a vortex/surface interaction. The modeling technique promises to be a practical, cost effective approach to predicting the aerodynamic characteristics of fighter wings at high angle of attack; however, further development of the model is required for the highly three-dimensional separated zones involving strong vortical action. Author (GRA)

N85-10018# Notre Dame Univ., Ind. Aerodynamics Lab.
AERODYNAMICS OF AIRFOILS SUBJECT TO 3-DIMENSIONAL PERIODIC GUSTS Final Report
H. Atassi 31 Aug. 1983 55 p
(Grant AF-AFOSR-0269-82)
(AD-A145149; Rept-1983-12; AFOSR-84-0757TR) Avail: NTIS HC A04/MF A01 CSCL 20/4

A general analysis of periodic three-dimensional vortical disturbances of streaming motions around streamlined and bluff bodies is developed using a unified approach wherein the mathematical problem is reduced to solving a single inhomogeneous wave equation with non-constant coefficients. In the limit of vanishing Mach number, the problem is formulated in terms of an inhomogeneous Fredholm integral equation of the second kind. The analysis is first applied to study the unsteady aerodynamics of an airfoil of arbitrary shape moving at low Mach number in a three-dimensional periodic gust pattern. Because the homogeneous equation has a non-trivial solution, a special procedure was developed for its solution and uniqueness is obtained by applying the Kutta condition at the trailing edge. Results were compared with those obtained from a nonlinear two dimensional gust theory and linear oblique gust analyses. Comparion shows a very strong influence of the airfoil geometry and mean

flow angle of attack and of the gust parameters on the unsteady lift and moment coefficients. In fact, depending on the conditions considered, the unsteady lift and moment coefficients can be several times larger or smaller than those obtained from linear theories. A superposition principal was derived whereby the unsteady lift and moment acting on a thin airfoil with small camber and small angle of attack and subject to a two-dimensional gust can be constructed by linear superposition to the Sears lift and moment of three independent components accounting separately for the effects of airfoil thickness, airfoil camber and non-zero angle of attack of the mean flow. GRA

N85-10019# Massachusetts Inst. of Tech., Cambridge. Computational Fluid Dynamics Lab.
COMPUTATIONAL METHODS FOR COMPLEX FLOWFIELDS Annual Report, 1 Jun. 1983 - 31 May 1984
E. M. Murman and J. R. Baron 22 Jun. 1984 67 p
(Grant AF-AFOSR-0136-82; AF Proj. 2307)
(AD-A145219; AFOSR-84-0755TR) Avail: NTIS HC A04/MF A01 CSCL 12/1

The development of solution algorithms for complex flowfields is the continuing objective of the research. Major focus is on use of coupled subdomains and descriptions which are either preselected or adapted to fit the physical events when necessary. The non-adaptive embedded mesh algorithm has completed airfoil solutions with an allowance for highly stretched meshes, alternate grids and reducing smoothing. A new algorithm is combining features from cell and nodal-centered methods to permit general embedded topology. Adaptive embedded mesh procedures have been extended to and carried out for two-dimensional Euler, subsonic, transonic and supersonic flows. An optimal distribution of local Courant numbers has been considered as a basis for accelerating the solution approach to a steady state.
Author (GRA)

N85-10020# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
EXPERIMENTAL DATA BASE FOR COMPUTERS PROGRAM ASSESSMENT. REPORT OF THE FLUID DYNAMICS PANEL WORKING GROUP 04: ADDENDUM
Loughton, England Jul. 1984 148 p refs
(AGARD-AR-138-Add; ISBN-92-835-1475-0) Avail: NTIS HC A07/MF A01

Data sets for high and low aspect radio wings in wing-alone and wing-body combination are presented to provide data for computer program assessment. For individual titles, see N85-10021 through N85-10025.

N85-10021# Lockheed-Georgia Co., Marietta.
TRANSONIC WING AND FAR FIELD TEST DATA ON A HIGH ASPECT RATIO TRANSPORT WING FOR THREE DIMENSIONAL COMPUTATIONAL METHOD EVALUATION c05
K. P. Burdges and B. L. Hinson *In* AGARD Exptl. Data Base for Computers Program Assessment Jul. 1984 p refs (For primary document see N85-10020 01-02)
Copyright. Avail: NTIS HC A07/MF A01

Force and pressure data were obtained on a moderate aspect ratio transport wing that is representative of high performance supercritical technology. The pressure distributions on this wing exhibit recompression of the local supersonic flow over the front part of the wing, terminating the supersonic region with a moderate strength, swept shock wave. Far field boundary conditions were measured to provide a rigorous test case for theoretical models and eliminate uncertainties about wind tunnel wall effects. Tables show pressure coefficients with m=0.62, 0.80, 0.82, and 0.84 for the upper and lower surfaces and the far field. Lift, pitching moments, and drag data are summarized in graphs. A.R.H.

N85-10022# Lockheed-Georgia Co., Marietta.
TRANSONIC WING AND FAR FIELD TEST DATA ON A MODERATE ASPECT RATIO WING FOR THREE DIMENSIONAL COMPUTATIONAL METHOD EVALUATION c05
K. P. Burdges and B. L. Hinson *In* AGARD Exptl. Data Base for Computers Program Assessment Jul. 1984 25 p refs (For primary document see N85-10020 01-02)
Copyright. Avail: NTIS HC A07/MF A01

Force and pressure data were provided on a state-of-the-art supercritical moderate aspect ratio transport wing for evaluation of three-dimensional flow computation methods. The wing, though simply defined, is representative of high performance supercritical technology. The pressure distributions on this wing exhibit recompression of the local supersonic flow over the front part of the wing, terminating the supersonic region with a moderate strength, swept shock wave. The strength of the shock wave increases with free stream Mach number until a small region of trailing edge separation occurs in the 70% semispan pressure data for M = .84. The latter condition is an interesting test case for viscous modeling techniques. The accuracy of current computational methods causes concern over the influence of small differences between far field boundary conditions of wind tunnel experiments and the free air boundary condition applied at the edge of the mathematical computational zone. In an effort to improve the rigor of the code evaluation, a far field boundary condition was measured in the experiment to be included as a boundary condition when evaluating computational methods.
Author

N85-10023# Aircraft Research Association Ltd., Bedford (England).
PRESSURE DISTRIBUTIONS MEASURED ON RESEARCH WING M100 MOUNTED ON AN AXISYMMETRIC BODY
M. P. Carr and K. C. Pallister *In* AGARD Exptl. Data Base for Computer Program Assessment Jul. 1984 36 p refs (For primary document see N85-10020 01-02)
Avail: NTIS HC A07/MF A01

Measurements of surface pressure distributions on a research wing in a transonic wind tunnel are presented. Tabulated data are given for an incidence range at constant Mach number and a Mach number range at approximately constant lift coefficient. Overall force measurements for the same test conditions as the presented pressures are also given. M.A.C.

N85-10024# Aircraft Research Association Ltd., Bedford (England).
PRESSURE DISTRIBUTIONS MEASURED ON RESEARCH WING M86 MOUNTED ON AN AXISYMMETRIC BODY
In AGARD Exptl. Data Base for Computers Program Assessment Jul. 1984 25 p refs (For primary document see N85-10020 01-02)
Copyright. Avail: NTIS HC A07/MF A01

Surface pressure distributions are measured on a research wind in a transonic wind tunnel. Tabulated data are given for seven conditions covering three Mach numbers. Force measurements for the same test conditions as the presented pressures are also given. M.A.C.

N85-10025# Aeronautical Research Inst. of Sweden, Bromma.
PRESSURE DISTRIBUTION ON A SWEPT WING AIRCRAFT IN FLIGHT
Arild Bertelrud *In* AGARD Exptl. Data Base for Computers Program Assessment Jul. 1984 31 p refs (For primary document see N85-10020 01-02)
Avail: NTIS HC A07/MF A01

A comprehensive data base is developed for the flow on a swept wing aircraft under flight conditions. Four cases are presented. The data concerns pressure distributions, some skin friction information and very limited boundary layer results. The full data base contains several other types of data (including turbulence measurements), measurements taken under instationary conditions as well as particular investigations concerning drag reduction, junction flow, transition etc. The data structure obtained during a flight test differs from tunnel results in several respects. Ample and redundant data with elaborate checking of data validity and repeatability are required. Real life conditions, i.e., no wind tunnel walls, atmospheric turbulence (intensity and scale) vary with each flight and each altitude. For the present

tests the following are observed: (1) natural transition, and (2) all data obtained are for trimmed conditions; i.e., the stabilizer/elevator has slightly different setting for each flight condition d-5. M.A.C.

N85-10086# Science Council of Japan, Tokyo.
BALLOON OBSERVATIONS
In its Space Res. in Japan May 1984 p 45-51 (For primary document see N85-10082 01-12)
Avail: NTIS HC A05/MF A01

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N85-10026 Department of the Air Force, Washington, D.C.
SIMPLE NONRESTRICTIVE ARM RESTRAINT SYSTEM Patent
L. J. Specker, T. J. Jennings, and M. P. Connors, inventors (to Air Force) Issued 31 Jul. 1984 8 p Supersedes AD-D009950 (AD-D011216; US-Patent-4,462,563; US-Patent-Appl-SN-433597; US-Patent-Class-244-122) Avail: US Patent and Trademark Office CSCL 01/3

An improved arm restraint system for moving the arms of an ejection seat occupant to restrained positions along the sides of the occupant's torso upon initiation of emergency escape ejection of the seat and occupant from an aircraft includes a multistrap and guide ring arrangement wherein the elbow of the aircrewmen is drawn tightly against the torso side through a direct interconnection there between and concurrently his hands/wrists are drawn to the ejection control of the seat. GRA

N85-10027# National Transportation Safety Board, Washington, D. C. Bureau of Safety Programs.
REVIEW OF AIRCRAFT ACCIDENT DATA: US GENERAL AVIATION Annual Report, 1981
8 Jun. 1984 155 p
(PB84-230960; NTSB/ARG-84-02) Avail: NTIS HC A08/MF A01

This report presents a statistical compilation and review of general aviation accidents which occurred in 1981. The accidents reported are all those involving U.S. registered aircraft not conducting air carrier revenue operations under 14 CFR 121, 14 CFR 127, or 14 CFR 135. The report is divided into sections, each of which (except for the All Operations Section) presents a review of a subset of all general aviation accidents. Each subset represents aircraft of similar types of aircraft being operated for particular purposes. Several tables present accident parameters for 1981 only, and each section includes tabulations which present comparative statistics for 1981 and for the five year period 1976-1980. Author

N85-10028# Federal Aviation Agency, Atlantic City, N.J.
A STUDY OF BIRD INGESTIONS INTO LARGE HIGH BYPASS RATIO TURBINE AIRCRAFT ENGINES Final Report
Gary Frings Sep. 1984 152 p refs
(DOT/FAA-CT-84-13) Avail: NTIS HC A08/MF A01

Bird ingestions into large high bypass ratio turbine aircraft engines were studied. The worldwide study covered over 2.7 million operations by 1,513 aircraft consisting of the DC8, DC10, B747, B767, A300, A310, and L1011. The numbers, weights, and species of birds which are ingested into these engines and resulting engine damage, were determined. E.A.K.

N85-10029# National Transportation Safety Board, Washington, D. C. Bureau of Accident Investigation.
PROCEEDINGS OF THE AVIATION ACCIDENT INVESTIGATION SYMPOSIUM
13 Jul. 1984 205 p Proc. held in Springfield, Va., 26-28 Apr. 1983
(PB84-917004; NTSB/RP-84-01) Avail: NTIS HC A10/MF A01

In April, 1983, the National Transportation Safety Board held an accident investigation symposium to discuss Safety Board programs and to receive industry input on Safety Board accident investigation policies and procedures. Over 280 participants from industry, government and the military participated in the symposium on panels to discuss issues, and in working groups. At the conclusion of the symposium, the four industry moderated working groups presented 57 recommendations to the Safety Board related to aviation accident investigation. Another 11 recommendations were submitted by participants after the close of the symposium. The recommendations and the Safety Board responses to the recommendations are given. Topics discussed are aircraft accident investigations, human factors engineering, aircraft safety, and human performance. R.J.F.

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N85-10030# Air Force Geophysics Lab., Hanscom AFB, Mass.
GLOBAL POSITIONING SYSTEM: GEODETIC APPLICATIONS
D. H. Eckhardt 15 Aug. 1984 8 p Presented at the Intern. Symp., Point Positioning in Marine Geodesy, Maracaibo, 23-27 Feb. 1983
(AF Proj. 2309)
(AD-A144904; AFGL-TR-84-0209) Avail: NTIS HC A02/MF A01 CSCL 08/5

The NAVSTAR Global Positioning System (GPS) is a joint service spacebased radio navigation network of the U.S. Department of Defense with the Air Force as the executive service. The system will be fully operational in the late 1980's GPS and will provide accurate time and three dimensional position and velocity information to users anywhere in the world, including those in near-earth orbits. The (real-time) navigation position determinations will be based on satellite-to-user transit times of modulated microwave signals broadcast by the GPS satellites. For navigation, the capability for absolute positioning on the order of 200 m or better will be made available for general civil use. The highest accuracy three dimensional navigation capability, on the order of 16 m, will be made available to U.S. Government agencies and to qualified U.S. commercial users where proper security measures can be established Even higher accuracy relative geodetic positioning capability, on the order of 1 to 10 cm (depending on the baseline lengths), will be attainable by radio interferometric (differential phase) techniques which will be available for general civil use. Achieving these high geodetic accuracies requires continuous simultaneous observations for up to two or three hours at each survey site. Accurate relative (non real-time) navigation positions and velocities, using Doppler and integrated Doppler techniques, will also be feasible for general civil use. GRA

N85-10031# Army Engineer Topographic Labs., Fort Belvoir, Va.
TERRAIN NAVIGATION CONCEPTS FOR AUTONOMOUS VEHICLES
R. D. Leighty Jun. 1984 16 p
(AD-A144994; ETL-R-065) Avail: NTIS HC A02/MF A01 CSCL 17/7

The Army's Artificial Intelligence/Robotics Demonstrator Program has resulted in expression of interest in a large number of potential autonomous vehicle applications within the Army Laboratory and TRADOC communities. In general this interest is based on the potential advantages of autonomous vehicle systems to improve efficiency of operations and to remove humans from hazardous environments on the battlefield. Examples of proposed autonomous vehicle applications are: intelligence collection, NBC

reconnaissance, weapons platforms, transportation of supplies and materials, and medical evacuation. Author (GRA)

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N85-10032*# United Technologies Research Center, East Hartford, Conn.

HELICOPTER ROTOR BLADE DESIGN FOR MINIMUM VIBRATION Final Report

Robert B. Taylor Washington NASA Oct. 1984 144 p refs (Contract NAS2-11025)

(NASA-CR-3825; NAS 1.26:3825; AVSCOM-TR-84-A-2; R33-915783-27) Avail: NTIS HC A07/MF A01 CSCL 01C

The importance of blade design parameters in rotor vibratory response and the design of a minimum vibration blade based upon this understanding are examined. Various design approaches are examined for a 4 bladed articulated rotor operating at a high speed flight condition. Blade modal shaping, frequency placement, structural and aerodynamic coupling, and intermodal cancellation are investigated to systematically identify and evaluate blade design parameters that influence blade airloads, blade modal response, hub loads, and fuselage vibration. The relative contributions of the various components of blade force excitation and response to the vibratory hub loads transmitted to the fuselage are determined in order to isolate primary candidates for vibration alleviation. A blade design is achieved which reduces the predicted fuselage vibration from the baseline blade by approximately one half. Blade designs are developed that offer significant reductions in vibration (and fatigue stresses) without resorting to special vibration alleviation devices, radical blade geometries, or weight penalties. M.A.C.

N85-10033*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

A MATHEMATICAL SIMULATION MODEL OF THE CH-47B HELICOPTER, VOLUME 1

Jeanine M. Weber, Tung Y. Liu (Computer Sciences Corp.), and William Chung (Computer Sciences Corp.) Apr. 1984 137 p refs 2 Vol.

(NASA-TM-84351-Vol-1; A-9303-Vol-1; NAS 1.15:84351-Vol-1) Avail: NTIS HC A07/MF A01 CSCL 01C

A nonlinear simulation model of the CH-47B helicopter was adapted for use in the NASA Ames Research Center (ARC) simulation facility. The model represents the specific configuration of the ARC variable stability CH-47B helicopter and will be used in ground simulation research and to expedite and verify flight experiment design. Modeling of the helicopter uses a total force approach in six rigid body degrees of freedom. Rotor dynamics are simulated using the Wheatley-Bailey equations including steady-state flapping dynamics. Also included in the model is the option for simulation of external suspension, slung-load equations of motion. Author

N85-10034*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.

ROTOR SYSTEMS RESEARCH AIRCRAFT AIRPLANE CONFIGURATION FLIGHT-TEST RESULTS Final Report

W. D. Painter and R. E. Erickson (NASA. Ames Research Center) Oct. 1984 13 p refs Presented at the AIAA Aircraft Design Systems and Operations Meeting, San Diego, Calif., 31 Oct. - 2 Nov. 1984

(NASA-TM-85911; H-1263; NAS 1.15:85911; AIAA-84-2465) Avail: NTIS HC A02/MF A01 CSCL 01C

The rotor systems research aircraft (RSRA) has undergone ground and flight tests, primarily as a compound aircraft. The purpose was to train pilots and to check out and develop the design flight envelope. The preparation and flight test of the RSRA in the airplane, or fixed-wind, configuration are reviewed and the test results are discussed. E.A.K.

N85-10035*# National Aeronautics and Space Administration, Washington, D. C.

DFVLR ROTORCRAFT: CONSTRUCTION AND ENGINEERING

H. J. Langer Aug. 1984 64 p Transl. into ENGLISH of "DFVLR-rotorversuchsstand-konstruktion und entwicklung" rept. Brunswick, 1984 60 p Transl. by Scientific Translation Service, Santa Barbara, Calif. Original doc. prep. by Inst. fuer Flugmechanik, DFVLR, Brunswick

(Contract NASw-3542)

(NASA-TM-77740; NAS 1.15:77740) Avail: NTIS HC A04/MF A01 CSCL 01C

A helicopter rotor test stand is described. Full scale helicopter components can be tested such as hingeless fiberglass rotors and two blade rotor with flapping hinge, or a hybrid system. The facility is used to test stability, rotor components and downwind components. M.A.C.

N85-10036*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

APPLICATIONS OF NUMERICAL OPTIMIZATION METHODS TO HELICOPTER DESIGN PROBLEMS: A SURVEY

Hirokazu Miura Oct. 1984 24 p refs

(NASA-TM-86010; A-9856; NAS 1.15:86010) Avail: NTIS HC A02/MF A01 CSCL 01C

A survey of applications of mathematical programming methods is used to improve the design of helicopters and their components. Applications of multivariable search techniques in the finite dimensional space are considered. Five categories of helicopter design problems are considered: (1) conceptual and preliminary design, (2) rotor-system design, (3) airframe structures design, (4) control system design, and (5) flight trajectory planning. Key technical progress in numerical optimization methods relevant to rotorcraft applications are summarized. M.A.C.

N85-10037*# Kansas Univ. Center for Research, Inc., Lawrence. Flight Research Lab.

DESIGN OF A DIGITAL RIDE QUALITY AUGMENTATION SYSTEM FOR COMMUTER AIRCRAFT Final Report

Terry A. Hammond, Shailesh P. Amin, James D. Paduano, and David R. Downing Oct. 1984 366 p refs

(Grant NAG1-345)

(NASA-CR-172419; NAS 1.26:172419) Avail: NTIS HC A16/MF A01 CSCL 01C

Commuter aircraft typically have low wing loadings, and fly at low altitudes, and so they are susceptible to undesirable accelerations caused by random atmospheric turbulence. Larger commercial aircraft typically have higher wing loadings and fly at altitudes where the turbulence level is lower, and so they provide smoother rides. This project was initiated based on the goal of making the ride of the commuter aircraft as smooth as the ride experienced on the major commercial airliners. The objectives of this project were to design a digital, longitudinal mode ride quality augmentation system (RQAS) for a commuter aircraft, and to investigate the effect of selected parameters on those designs. Author

N85-10038# Army Aviation Engineering Flight Activity, Edwards AFB, Calif.

AIRWORTHINESS AND FLIGHT CHARACTERISTICS TEST OF THE JOH-6A LIGHT COMBAT HELICOPTER CONFIGURED WITH A WIRE STRIKE PROTECTION SYSTEM Final Report, 30 Aug. - 2 Sep. 1983

J. L. Webre, R. Woratschek, E. L. Mitchell, and R. S. Adler Nov. 1983 52 p

(AD-A144880) Avail: NTIS HC A04/MF A01 CSCL 01/3

A limited airworthiness and flight characteristics test on the JOH-6A Light Combat helicopter (LCH) configured with a wire strike protection system (WSPS) was conducted to substantiate the airworthiness. Tests were conducted at Edwards in four flights totaling 4.1 productive flight hours. The insufficient ground

clearance of the lower cutter allows contact with the ground and is a deficiency. The handling qualities of the JOH-6A LCH with WSPS installed are essentially unchanged from the JOH-6A LCH without WSPS. GRA

N85-10039# Army Aviation Engineering Flight Activity, Edwards AFB, Calif.
AIRWORTHINESS AND FLIGHT CHARACTERISTICS (A AND FC) TEST OF THE EH - 1X/EH - 1H HELICOPTER CONFIGURATIONS Final Report, 26 Jul. - 19 Sep. 1983
G. T. Downs, J. M. Adkins, J. I. Nagata, J. L. Kimberly, and J. L. Linehan Jan. 1984 74 p
(AD-A144881) Avail: NTIS HC A04/MF A01 CSCL 01/3

Level flight performance tests were conducted on five EH-1X/EH-1H helicopter configurations to determine the change in drag characteristics with the addition of external mission equipment to the standard UH-1H helicopter configuration. Comparison of data from a baseline test configuration with previously published UH-1H and YUH-1H data indicated approximately 8.0 increase in equivalent flat plate area which was attributed to the external mission antennas, low reflective infrared/optical paint, and heat suppression kit with vertical exhaust ejector. Installation of the M-130 chaff/flare dispensers resulted in a further increase in equivalent flat plate area of 5.0 sq ft. Replacing the vertical exhaust ejector with the hot metal plus plume infrared suppressor, including the ALQ-144 countermeasures jammer resulted in a reduction in equivalent flat plate area of 1.5 sq ft. Installation of the direction finding antennas resulted in no measurable increase in drag. Addition of all external mission equipment and the hot metal plus plume exhaust resulted in a total increased equivalent flat plate area of approximately 11.5 sq ft. from the standard UH-1H helicopter. GRA

N85-10040# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
THE INFLUENCE OF LARGE SCALE COMPUTING ON AIRCRAFT STRUCTURAL DESIGN
Loughton, England Aug. 1984 55 p refs Meeting held in Sienna, Italy, 2-6 Apr. 1984
(AGARD-R-706; ISBN-92-835-0364-3) Avail: NTIS HC A04/MF A01

Advances in large scale computing capacity and how they affect aeronautical design are reported. The use of vector processing to solve aircraft structural problems, the influence of new computing systems on computational mechanisms, and use of artificial intelligence in design processing is discussed. The role of AGARD and its response to the challenge is examined. For individual titles, see N85-10041 through N85-10043.

N85-10041# Societe Nationale Industrielle Aerospatiale, Toulouse (France). Structural Methods Dept.
AEROSPATIALE'S EXPERIMENTATIONS OF VECTORIZATION ON SUPERCOMPUTERS FOR AIRCRAFT STRUCTURAL PROBLEMS
J. M. Thomas and J. C. Dunyach *In* AGARD The Influence of Large Scale Computing on Aircraft Struct. Design Aug. 1984 14 p (For primary document see N85-10040 01-05)
Copyright. Avail: NTIS HC A04/MF A01

The vectorial and parallel performances of new computer architectures was tested. The experiment consisted of adapting existing structural stress routines to existing computers. The performance throughput gain expected from these computers within the context of industrial processing of large programs is estimated. The cost for adapting the programs to the computers is assessed, and basic rules which apply to the vectorization of most programs are established. E.A.K.

N85-10042*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
IMPACT OF NEW COMPUTING SYSTEMS ON COMPUTATIONAL MECHANICS AND FLIGHT-VEHICLE STRUCTURES TECHNOLOGY
Ahmed K. Noor, Olaf O. Storaasli, and Robert E. Fulton *In* AGARD The Influence of Large Scale Computing on Aircraft Struct. Design Aug. 1984 29 p refs (For primary document see N85-10040 01-05)
Avail: NTIS HC A04/MF A01 CSCL 01C

Advances in computer technology which may have an impact on computational mechanics and flight vehicle structures technology were reviewed. The characteristics of supersystems, highly parallel systems, and small systems are summarized. The interrelations of numerical algorithms and software with parallel architectures are discussed. A scenario for future hardware/software environment and engineering analysis systems is presented. Research areas with potential for improving the effectiveness of analysis methods in the new environment are identified. E.A.K.

N85-10043# Cranfield Inst. of Tech., Bedfordshire (England). College of Aeronautics.
LARGE SCALE COMPUTING IN AERONAUTICAL DESIGN
A. J. Morris *In* AGARD The Influence of Large Scale Computing on Aircraft Struct. Design Aug. 1984 4 p (For primary document see N85-10040 01-05)
Avail: NTIS HC A04/MF A01

The use of new advances in large scale computing and software techniques and how they create comprehensive design programs is outlined. The role of artificial intelligence in making large design programs accessible to the single user is emphasized. The AGARD response to the challenge posed by the new a situation is discussed and a series of tasks is proposed. E.A.K.

N85-10399*# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
CRASHWORTHINESS OF LIGHT AIRCRAFT FUSELAGE STRUCTURES: A NUMERICAL AND EXPERIMENTAL INVESTIGATION
A. P. Nanyaro, R. C. Tennyson, and J. S. Hansen *In* NASA. Langley Research Center Res. in Struct. and Dyn., 1984 Oct. 1984 p 325-346 refs (For primary document see N85-10377 01-39)
Avail: NTIS HC A18/MF A01 CSCL 01C

N85-10400*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ANALYSIS OF A TRANSPORT FUSELAGE SECTION DROP TEST
E. L. Fasanella (Kentron International, Inc., Hampton, Va.), R. J. Hayduk, M. P. Robinson, and E. Widmayer (Boeing Commercial Airplane Co., Seattle) *In its* Res. in Struct. and Dyn., 1984 Oct. 1984 p 347-368 refs (For primary document see N85-10377 01-39)
Avail: NTIS HC A18/MF A01 CSCL 01C

N85-10021# Lockheed-Georgia Co., Marietta.
TRANSONIC WING AND FAR FIELD TEST DATA ON A HIGH ASPECT RATIO TRANSPORT WING FOR THREE DIMENSIONAL COMPUTATIONAL METHOD EVALUATION
K. P. Burdges and B. L. Hinson *In* AGARD Exptl. Data Base for Computers Program Assessment Jul. 1984 p refs (For primary document see N85-10020 01-02)
Copyright. Avail: NTIS HC A07/MF A01

N85-10022# Lockheed-Georgia Co., Marietta.
TRANSONIC WING AND FAR FIELD TEST DATA ON A MODERATE ASPECT RATIO WING FOR THREE DIMENSIONAL COMPUTATIONAL METHOD EVALUATION
K. P. Burdges and B. L. Hinson *In* AGARD Exptl. Data Base for Computers Program Assessment Jul. 1984 25 p refs (For primary document see N85-10020 01-02)
Copyright. Avail: NTIS HC A07/MF A01

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N85-10044*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
PERIPHERAL VISION HORIZON DISPLAY (PVHD)
Apr. 1984 131 p refs Conf. held at Edwards, Calif., 15-16 Mar. 1983
(NASA-CP-2306; H-1232; NAS 1.55:2306) Avail: NTIS HC A07/MF A01 CSCL 01D

A Canadian invention, the peripheral vision horizon display (PVHD), shows promise in alleviating vertigo or disorientation in pilots flying under instrument conditions and easing the piloting task when flying in weather or other conditions requiring close attention to aircraft attitude instruments. A diversity of research and applied work was being done to investigate and validate the benefits of the PVHD during the years immediately preceding this conference. Organizers of the conference were able to assemble a group of outstanding presenters representing academic, industrial, and military. The theoretical foundation and applied use of the PVHD are discussed, and results from operational tests are presented. For individual titles, see N85-10045 through N85-10059.

N85-10045*# Air Force Inspection and Safety Center, Norton AFB, Calif. Life Sciences Div.
PERSONAL EXPERIENCE WITH THE PVHD AND OPINION OF SITUATIONS IN WHICH A WIDE FIELD OF VIEW (FOV) PVHD MIGHT BE HELPFUL
Grant B. McNaughton *In* NASA. Dryden Flight Research Center Peripheral Vision Horizon Display (PVHD) Apr. 1984 p 1-10 (For primary document see N85-10044 01-06)
Avail: NTIS HC A07/MF A01 CSCL 01D

The peripheral vision horizon display (PVHD) was examined. It is contended that many aircraft accidents could have been prevented if, the PVHD had been applied, since all the incidents had common characteristics: night, weather, formation, false horizons, and situation which require head down time. It is concluded that the PVHD could be useful on any aircraft that flies in spatially disorienting/misorienting condition, such as night, weather, or formation. It is suggested that it might be particularly useful in aircraft, which by their design, are especially disorienting in such circumstances. E.A.K.

N85-10046*# Maltech Research Corp., Oakville (Ontario).
THE MALCOLM HORIZON: HISTORY AND FUTURE
Richard Malcolm *In* NASA. Dryden Flight Research Center Peripheral Vision Horizon Display (PVHD) Apr. 1984 p 11-40 refs (For primary document see N85-10044 01-06)
Avail: NTIS HC A07/MF A01 CSCL 01D

The development of the Malcolm Horizon, a peripheral vision horizon used in flight simulation, is discussed. A history of the horizon display is presented as well as a brief overview of vision physiology, and the role balance plays is spatial orientation. Avenues of continued research in subconscious cockpit instrumentation are examined. M.A.C.

N85-10047*# Pennsylvania State Univ., University Park. Dept. of Psychology.
THE TWO MODES OF VISUAL PROCESSING: IMPLICATIONS FOR SPATIAL ORIENTATION
Herschel W. Leibowitz, C. L. Shupert, and Robert B. Post (California Univ., Davis) *In* NASA. Dryden Flight Research Center Peripheral Vision Horizon Display (PVHD) Apr. 1984 p 41-44 refs (For primary document see N85-10044 01-06)
Avail: NTIS HC A07/MF A01 CSCL 01D

The roles of the focal and ambient visual systems in spatial orientation are discussed. The two modes are defined and compared. The contribution of each system is illustrated through examples such as spatial disorientation/motion sickness, vehicle guidance/night driving, visual narrowing under stress/cortical brain damage, and aircraft instrumentation. Emphasis is placed on the need for testing procedures for the ambient system. M.A.C.

N85-10048*# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).
THEORY UNDERLYING THE PERIPHERAL VISION HORIZON DEVICE
K. E. Money *In* NASA. Dryden Flight Research Center Peripheral Vision Horizon Display (PVHD) Apr. 1984 p 45-56 refs (For primary document see N85-10044 01-06)
Avail: NTIS HC A07/MF A01 CSCL 01D

Peripheral Vision Horizon Device (PVHD) theory states that the likelihood of pilot disorientation in flight is reduced by providing an artificial horizon that provides orientation information to peripheral vision. In considering the validity of the theory, three areas are explored: the use of an artificial horizon device over some other flight instrument; the use of peripheral vision over foveal vision; and the evidence that peripheral vision is well suited to the processing of orientation information. B.G.

N85-10049*# California Univ., Davis. Dept. of Ophthalmology.
STIMULUS FACTORS IN MOTION PERCEPTION AND SPATIAL ORIENTATION c54
R. B. Post and C. A. Johnson *In* NASA. Dryden Flight Research Center Peripheral Vision Horizon Display (PVHD) Apr. 1984 p 57-62 refs (For primary document see N85-10044 01-06)
Avail: NTIS HC A07/MF A01 CSCL 05H

The Malcolm horizon utilizes a large projected light stimulus Peripheral Vision Horizon Device (PVHD) as an attitude indicator in order to achieve a more compelling sense of roll than is obtained with smaller devices. The basic principle is that the larger stimulus is more similar to visibility of a real horizon during roll, and does not require fixation and attention to the degree that smaller displays do. Successful implementation of such a device requires adjustment of the parameters of the visual stimulus so that its effects on motion perception and spatial orientation are optimized. With this purpose in mind, the effects of relevant image variables on the perception of object motion, self motion and spatial orientation are reviewed. Author

N85-10050*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE PERIPHERAL VISUAL CUE ASSESSMENT FACILITY AT AMES RESEARCH CENTER c54
Richard F. Haines *In* NASA. Dryden Flight Research Center Peripheral Vision Horizon Display (PVHD) Apr. 1984 p 63-70 refs (For primary document see N85-10044 01-06)
Avail: NTIS HC A07/MF A01 CSCL 05H

The Peripheral Visual Cue Assessment Facility was established to study various responses to controlled dynamic stimuli that could be considered as visual analogs of some real world counterparts such as the horizon. Careful stimulus control permits specific responses to be traced to specific stimulus dynamics. The ability of the visual system to assess various kinds of stimulus motion is examined. A major emphasis is placed upon the peripheral vision field, which plays an important role in a pilot's assessment of where he is in space, where he is going, how fast he is travelling, and what angular and linear rates of movement is taking place. The facility was designed to be able to carry out carefully controlled psychophysical vision research over a wide angular range. E.R.

N85-10051*# School of Aerospace Medicine, Brooks AFB, Tex. Crew Technology Div.
EVALUATION OF THE MALCOLM HORIZON IN A MOVING-BASE FLIGHT SIMULATOR
Kent K. Gillingham *In* NASA. Dryden Flight Research Center Peripheral Vision Horizon Display (PVHD) Apr. 1984 p 71-80 refs (For primary document see N85-10044 01-06)
Avail: NTIS HC A07/MF A01 CSCL 01D

The efficacy of the Malcolm Horizon (MH) in a controlled, simulated, instrument flight environment was examined. Eight flight

parameters were used to compare performance under experimental and control conditions. The parameters studied were pitch attitude, roll attitude, turn rate, airspeed, vertical velocity, heading, altitude, and course deviation. Testing of a commercial realization of the MH concept in a flight simulator revealed strengths and weaknesses of the currently available MH hardware. E.R.

N85-10052*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECTS OF FOVEAL INFORMATION PROCESSING c52
Randall L. Harris, Sr. *In* NASA. Dryden Flight Research Center Peripheral Vision Horizon Display (PVHD) Apr. 1984 p 81-88 refs (For primary document see N85-10044 01-06)
Avail: NTIS HC A07/MF A01 CSCL 06P

The scanning behavior of pilots must be understood so that cockpit displays can be assembled which will provide the most information accurately and quickly to the pilot. The results of seven years of collecting and analyzing pilot scanning data are summarized. The data indicate that pilot scanning behavior is: (1) subsconscious; (2) situation dependent; and (3) can be disrupted if pilots are forced to make conscious decisions. Testing techniques and scanning analysis techniques have been developed that are sensitive to pilot workload. B.W.

N85-10053*# Air Force Flight Test Center, Edwards AFB, Calif.
PERIPHERAL VISION HORIZON DISPLAY ON THE SINGLE SEAT NIGHT ATTACK A-10
Daniel F. Nims *In* NASA. Dryden Flight Research Center Peripheral Vision Horizon Display (PVHD) Apr. 1984 p 89-96 (For primary document see N85-10044 01-06)
Avail: NTIS HC A07/MF A01 CSCL 01D

The concept of the peripheral vision horizon display (PVHD) held promise for significant reduction in workload for the single seat night attack pilot. For this reason it was incorporated in the single seat night attack (SSNA) A-10. The implementation and results of the PVHD on the SSNA A-10 are discussed as well as the SSNA program. The part the PVHD played in the test and the results and conclusions of that effort are also considered. Author

N85-10054*# Air Force Test Pilot School, Edwards AFB, Calif.
PERIPHERAL VISION HORIZON DISPLAY TESTING IN RF-4C AIRCRAFT
Lloyd B. Hammond, Jr. *In* NASA. Dryden Flight Research Center Peripheral Vision Horizon Display (PVHD) Apr. 1984 p 97-102 (For primary document see N85-10044 01-06)
Avail: NTIS HC A07/MF A01 CSCL 01D

A test program to assess the capability of the peripheral vision horizon display (PVHD) to provide peripheral attitude cues to the pilot is described. The system was installed in the rear cockpit of a RF-4C aircraft, selected because its poor instrument crosscheck conditions. The PVHD test plan was designed to assess three primary areas: (1) ability of the system to reduce spatial disorientation; (2) ability of the system to aid the pilot in recovering from unusual attitudes; and (3) improvement in pilot performance during instrument landing system (ILS) approaches. Results of preliminary test flights are summarized. The major problem areas concern the distinction of the display itself and the capability of the display to provide pitch motion cues. M.G.

N85-10055*# Calspan Corp., Buffalo, N. Y. Flight Research Dept.
EXTRACTS FROM THE TEST PLAN FOR IN-FLIGHT EVALUATION OF THE NT-33A PERIPHERAL VISION DISPLAY
Louis Knotts *In* NASA. Dryden Flight Research Center Peripheral Vision Horizon Display (PVHD) Apr. 1984 p 103-110 refs (For primary document see N85-10044 01-06)
Avail: NTIS HC A07/MF A01 CSCL 01D

The Peripheral Vision Display (PVD) which presents the pilot with a gyro stabilized artificial horizon projected onto his instrument panel by a laser light source is outlined. During instrument flight conditions, such a display allows the pilot to gain attitude awareness by sensing the horizon line through his peripheral vision. The pilot can detect changes to aircraft attitude without continuously referring back to his flight instruments. A second generation PVD unit was installed in the USAF/Calspan NT-33A during late 1982. An NT-33A flight evaluation of the display provides a unique opportunity to utilize a Workload Assessment Device (WAD) to obtain quantitative data regarding the utility of the PVD in reducing pilot workload. The experimental design and procedures for a two phase NT-33 PVD flight evaluation program is described. Author

N85-10056*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
NASA AMES-DRYDEN T-37 DEMONSTRATION COMMENTS
In its Peripheral Vision Horizon Display (PVHD) Apr. 1984 p 111-112 Prepared in cooperation with NASA. Ames Research Center (For primary document see N85-10044 01-06)
Avail: NTIS HC A07/MF A01 CSCL 01D

A homemade peripheral vision horizon device (PVHD) made from an eight-ball attitude indicator, with a slit cut at the equator of the eight ball, and a light source at its center that was used on a I-37 for several years is discussed. The instrument produced a sharp white line about one-fourth of an inch that extended completely across the cockpit from about the left to the right quarterpanels. The line remained parallel to the real horizon during all maneuvers. Its brightness and vertical distance from the horizon were adjustable in flight, as was the lateral center-of-rotation in later flights. Flight demonstrations were done on visual flight rules (VFR) moonless nights and over terrain with few lights. Pilot responses were mostly favorable to enthusiastic, with no negative reactions. Problem areas noted were the upright-inverted ambiguity; one pilot recovered inverted following an unusual attitude exercise and a general deterioration in the naturalness of cuing at bank angles greater than 60 deg or pitch attitudes greater than 30 deg. R.J.F.

N85-10057*# Air Force Flight Test Center, Edwards AFB, Calif.
EARLY AIR FORCE FLIGHT TEST CENTER (AFFTC) EXPERIENCE WITH PERIPHERAL VISION HORIZON DISPLAYS (PVHD)
B. Lyle Schofield *In* NASA. Dryden Flight Research Center Peripheral Vision Horizon Display (PVHD) Apr. 1984 p 113-115 ref (For primary document see N85-10044 01-06)
Avail: NTIS HC A07/MF A01 CSCL 01D

Three separate Air Force Flight Test Center (AFFTC) tests were conducted in 1980 and 1981 on two models of the peripheral vision horizon displays (PVHD) (Malcolm Horizon). A fixed base simulator test was conducted with twenty test pilot subjects using the Flight Simulator Demonstration Model which incorporated a Helium Neon laser as the light bar medium. Two separate flight tests were conducted by the Test Pilot School classes 80A and 80B in a Twin Otter commuter aircraft using the Stage A Model PVHD. The Xenon lighted A Model was tested in its original configuration by class 80A. Class 80B used a modified configuration which incorporated an AFFTC designed and manufactured hood. With the hood, the PVHD projected a thinner, distinct light bar. Only a few general remarks concerning the tests and unrestricted, overall conclusions reached by the author are presented. The conclusions of all three AFFTC evaluations of the PVHD concept were that it has not yet been adequately evaluated. There seems to be a significant learning curve associated with the PVHD and the project pilots for Test Pilot School Class 80B only got a good start on the learning curve. A lengthy learning curve for the PVHD should be anticipated in view of the training period required for the attitude display indicator (ADI). This does seem to point out that the PVHD, in its present form, is simply not as compelling as the natural horizon. It can also be concluded that any attempt at a valid evaluation of the PVHD concept can be done only under instrument meteorological conditions (IMC) or validly simulated IMC conditions. The knee in the learning curve, however, may be reached without full IMC, although it may take much longer to reach. R.J.F.

N85-10058*# Garrett Mfg. Ltd., Rexdale (Ontario).
PERIPHERAL VISION DISPLAYS: THE FUTURE
H. M. Assenheim *In* NASA. Dryden Flight Research Center

Peripheral Vision Horizon Display (PVHD) Apr. 1984 p 117-124 (For primary document see N85-10044 01-06)
Avail: NTIS HC A07/MF A01 CSCL 01D

Several areas of research relating to peripheral vision displays used by aircraft pilots are outlined: fiber optics, display color, and holography. Various capacities and specifications of gas and solid state lasers are enumerated. These lasers are potential sources of green light for the peripheral vision displays. The relative radiance required for rod and cone vision at different wavelengths is presented graphically. Calculated and measured retinal sensitivities (foveal and peripheral) are given for wavelength produced by various lasers. R.S.L.

N85-10058*# Garrett Mfg. Ltd., Rexdale (Ontario).
A PRODUCTION PERIPHERAL VISION DISPLAY SYSTEM
Brian Heinmiller *In* NASA. Dryden Flight Research Center Peripheral Vision Horizon Display (PVHD) Apr. 1984 p 125-128 (For primary document see N85-10044 01-06)
Avail: NTIS HC A07/MF A01 CSCL 01D

A small number of peripheral vision display systems in three significantly different configurations were evaluated in various aircraft and simulator situations. The use of these development systems enabled the gathering of much subjective and quantitative data regarding this concept of flight deck instrumentation. However, much was also learned about the limitations of this equipment which needs to be addressed prior to wide spread use. A program at Garrett Manufacturing Limited in which the peripheral vision display system is redesigned and transformed into a viable production avionics system is discussed. Modular design, interchangeable units, optical attenuators, and system fault detection are considered with respect to peripheral vision display systems. R.S.F.

N85-10060# Calspan Advanced Technology Center, Buffalo, N.Y.
A PRELIMINARY FLIGHT EVALUATION OF THE PERIPHERAL VISION DISPLAY USING THE NT-33A AIRCRAFT Final Report, Oct. 1982 - Dec. 1983
L. Knotts and V. Gawron Wright-Patterson AFB, Ohio AFWAL Mar. 1984 43 p
(Contract F33615-79-C-3618)
(AD-A145123; CALSPAN-6645-F-13; AFWAL-TR-84-3020) Avail: NTIS HC A03/MF A01 CSCL 01/4

The Malcolm Horizon, a Peripheral Vision Display (PVD), was installed in the NT-33A variable stability research aircraft. The display provided the evaluation pilot with a gyro stabilized horizon line of red laser light. An experiment was conducted to determine the effect of the PVD on pilot workload. Workload was inferred from performance on a secondary task, in this case, the Sternberg task generated by the Workload Assessment Device (WAD). The primary piloting task required maintenance of airspeed, altitude, and angle of bank during instrument flight conditions. Nine NT-33A flights were flown by two evaluation pilots. Presence of the PVD reduced the WAD reaction times of one of the pilots. The reaction times of the other pilot showed mixed results. In-flight data and the pilots subjective comments about the display are discussed. Author (GRA)

N85-10061# Boeing Aerospace Co., Seattle, Wash.
LED MULTIFUNCTION KEYBOARD ENGINEERING STUDY Final Technical Report, 25 Sep. 1981 - 30 Sep. 1982
R. J. Spiger and M. H. Tonkin Wright-Patterson AFB, Ohio AFWAL Jan. 1984 172 p
(Contract F33615-81-C-3624; AF Proj. 2403)
(AD-A145199; AFWAL-TR-83-3065) Avail: NTIS HC A08/MF A01 CSCL 09/2

The purpose of this report is to describe the background system definition which formed the basis for the multifunction keyboard engineering study and to describe the procedures employed and results obtained in conducting the study. The study objectives were: (1) the evaluation of the performance of a sunlight readable multifunction switch using an x-y dot matrix light emitting diode (LED) array and incorporating tactile feedback and (2) definition and evaluation of a multifunction keyboard architecture to use the multifunction switch. The procedures and results obtained in the course of this study were specifically directed toward the evaluation of the performance of a LED programmable pushbutton switch (PPS), developed both as an individual unit and as a component of a multifunction keyboard (MFK). While the PPS display is limited to a single 16 x 35 LED array size, the procedures employed in the evaluation are applicable to LED switch displays in general. Similarly, the procedures and results obtained using the PPS units as a four switch MFK module are illustrative of the operation of larger keyboard matrices up to a maximum of 28 switches. This study is divided into three general areas of effort. First was the establishment of requirements for the switch function and MFK architecture and capabilities. The second covers the evaluation of the PPS switch/display module. Incorporated in this work are measurements of display parameters, electrical and mechanical characteristics, and environmental testing. The third area of effort involved the incorporation of the PPS units and their associated logic and refresh control unit (LRCU) into a MFK system. GRA

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N85-10062 Department of the Air Force, Washington, D.C.
STALL ELIMINATION AND RESTART ENHANCEMENT DEVICE Patent
F. D. Stephens, inventor (to Air Force) Issued 24 Jul. 1984 4 p Supersedes AD-D009929
(AD-D011217; US-Patent-4,461,145; US-Patent-Appl-SN-433561; US-Patent-Class-60-226.3) Avail: US Patent and Trademark Office CSCL 21/5

Stall elimination means in a jet turbofan engine includes a plurality of pairs of generally parallel case struts arranged in an annular row in an annular fan bypass duct of the engine, and a series of freely-rotatable vanes, each vane disposed between a pair of the struts and movable between open and closed positions. In its open position, air flow in the duct, while in its closed position it extends generally across the duct and blocks most reverse air flow in the duct. The vane automatically rotates to the closed position in response to the onset of an adverse pressure gradient in the duct. GRA

N85-10063 Department of the Air Force, Washington, D.C.
VARIABLE INLET VANE ASSEMBLY FOR A GAS TURBINE COMBUSTION Patent
C. Marshall, inventor (to Air Force) Issued 17 Jul. 1984 7 p Supersedes AD-D009408
(AD-D011220; US-Patent-4,459,803; US-Patent-Appl-SN-350493; US-Patent-Class-60-39.23) Avail: US Patent and Trademark Office CSCL 21/5

This patent discloses a variable inlet vane assembly for use within the inlet area of a combustor, the vane assembly having a plurality of rotatable vanes situated within an annular-shaped opening in the inlet area of the combustor. Each vane is operated by the rotation of a crank assembly and actuator. The actuator meshes with the crank assembly through a sliding interface in order to accommodate axial and/or radial growth of the combustor with no loss in the precision of the control of air entering the combustor during rotation of the vanes. Such as arrangement substantially enhances the relight capability of the combustor. GRA

N85-10064*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMBUSTION GAS PROPERTIES I-ASTM JET A FUEL AND

DRY AIR
Robert E. Jones, Arthur M. Trout, Jerrold D. Wear, and Bonnie J. McBride Oct. 1984 12 p refs Document incl. microfiche supplement
(NASA-TP-2359; NAS 1.60:2359) Avail: NTIS HC E03/MF A01 CSCL 21E

A series of computations was made to produce the equilibrium temperature and gas composition for ASTM jet A fuel and dry air. The computed tables and figures provide combustion gas property data for pressures from 0.5 to 50 atmospheres and equivalence ratios from 0 to 2.0. S.B.

N85-10065*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPARISON OF NUMERICAL TECHNIQUES FOR INTEGRATION OF STIFF ORDINARY DIFFERENTIAL EQUATIONS ARISING IN COMBUSTION CHEMISTRY
Krishnan Radhakrishnan Oct. 1984 41 p refs Sponsored in part by Michigan Univ. and NRC
(Grants NAG3-147; NAG3-294)
(NASA-TP-2372; E-2149; NAS 1.60:2372) Avail: NTIS HC A03/MF A01 CSCL 21E

The efficiency and accuracy of several algorithms recently developed for the efficient numerical integration of stiff ordinary differential equations are compared. The methods examined include two general-purpose codes, EPISODE and LSODE, and three codes (CHEMEQ, CREK1D, and GCKP84) developed specifically to integrate chemical kinetic rate equations. The codes are applied to two test problems drawn from combustion kinetics. The comparisons show that LSODE is the fastest code currently available for the integration of combustion kinetic rate equations. An important finding is that an interactive solution of the algebraic energy conservation equation to compute the temperature does not result in significant errors. In addition, this method is more efficient than evaluating the temperature by integrating its time derivative. Significant reductions in computational work are realized by updating the rate constants (k = at(supra N) N exp(-E/RT) only when the temperature change exceeds an amount delta T that is problem dependent. An approximate expression for the automatic evaluation of delta T is derived and is shown to result in increased efficiency. Author

N85-10066# Pratt and Whitney Aircraft, East Hartford, Conn. Engineering Div.
DEVELOPMENT TRENDS AND REQUIREMENTS OF PROPULSION SYSTEM TECHNOLOGY FOR CIVIL AIRCRAFT
William A. Kerr 1984 19 p Presented at German Soc. of Aeron., Hamburg, 1-3 Oct. 1984
Avail: NTIS HC A02/MF A01

The major technology features in the PW0237 engine are discussed and the certification/flight test program is summarized. M.A.C.

N85-10067*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF COMBINED PRESSURE AND TEMPERATURE DISTORTION ORIENTATION ON HIGH-BYPASS-RATIO TURBOFAN ENGINE STABILITY
Ronald H. Soeder and Charles M. Mehalic Washington Oct. 1984 37 p refs
(NASA-TM-83771; E-2262; NAS 1.15:83771) Avail: NTIS HC A03/MF A01 CSCL 21E

Total-temperature, static-pressure and total-pressure distributions were measured in the inlet duct upstream of the engine inlet and within the fan and compressor of a YTF34 turbofan engine. Free-stream and boundary layer yaw angle variations were measured between a rotable screen assembly and the engine inlet. Total pressure distortions were generated using three 180 deg extent screens and total temperature distortions were generated using a rotatable hydrogen burner. Reynolds number index upstream of the rotatable screen assembly was maintained at 0.5 (based on the undistorted sectors at station 1, the inlet flow measuring station). The engine mechanical fan speed at sea level condition was rated at 7005 rpm. The engine was tested at a corrected fan speed of 90 percent of rated condition. Yaw angle increased between the rotatable screen assembly and the engine inlet. The largest variation in free-stream and boundary layer yaw angle occurs when the combined distortions are 180 deg out-of-phase. Static-pressure distortion increased exponentially as flow approached the engine. Total-pressure distortions were attenuated between the engine inlet and the compressor exit. Total-temperature distortion persisted through the compressor for all four combined distortions investigated. Author

N85-10068*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CREKID: A COMPUTER CODE FOR TRANSIENT, GAS-PHASE COMBUSTION OF KINETICS
David T. Pratt (Washington Univ., Seattle) and Krishnan Radhakrishnan Washington Oct. 1984 38 p refs
(Grant NAG3-147)
(NASA-TM-83806; E-2176; NAS 1.15:83806) Avail: NTIS HC A03/MF A01 CSCL 21B

A new algorithm was developed for fast, automatic integration of chemical kinetic rate equations describing homogeneous, gas-phase combustion at constant pressure. Particular attention is paid to the distinguishing physical and computational characteristics of the induction, heat-release and equilibration regimes. The two-part predictor-corrector algorithm, based on an exponentially-fitted trapezoidal rule, includes filtering of ill-posed initial conditions, automatic selection of Newton-Jacobi or Newton iteration for convergence to achieve maximum computational efficiency while observing a prescribed error tolerance. The new algorithm was found to compare favorably with LSODE on two representative test problems drawn from combustion kinetics. B.W.

N85-10069*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPUTATIONAL THERMO-FLUID DYNAMICS CONTRIBUTIONS TO ADVANCED GAS TURBINE ENGINE DESIGN
Robert W. Graham, John J. Adamczyk, and Harold E. Rohlik Washington 1984 13 p refs Proposed for presentation at the 23d Aerospace Sciences Meeting, Reno, Nev., 14-17 Jan. 1985; sponsored by AIAA
(NASA-TM-86865; E-2194; NAS 1.15:86865) Avail: NTIS HC A02/MF A01 CSCL 21E

The design practices for the gas turbine are traced throughout history with particular emphasis on the calculational or analytical methods. Three principal components of the gas turbine engine will be considered: namely, the compressor, the combustor and the turbine. B.W.

N85-10070# Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
PRELIMINARY MECHANICAL REDESIGN OF AN EXISTING GAS-TURBINE ENGINE TO INCORPORATE A HIGH-EFFICIENCY, LOW-PRESSURE-RATIO, HIGHLY REGENERATIVE CYCLE FOR MARINE APPLICATIONS M.S. Thesis
P. K. Poole and L. D. Owens, Jr. Jun. 1984 89 p
(Contract N66314-70-A-0073)
(AD-A144808) Avail: NTIS HC A05/MF A01 CSCL 21/5

The low-pressure-ratio, highly-regenerative, gas-turbine engine has been proposed as an efficient alternative to other current small-scale marine propulsion systems. This thesis provides a preliminary mechanical redesign of an existing gas-turbine engine to lower the compressor pressure ratio and incorporate a regenerator. One basic design is presented with several alternative turbine modifications. The redesign includes elimination of the second stage of the original two-stage centrifugal compressor, increasing the liner flow area of the existing annular combustor, elimination of the first stage of the three-stage axial turbine, reblading the last two turbine stages, sizing an appropriate regenerator, and designing annular inlet and outlet scrolls to direct gas flow to the regenerator. Due to the simplicity of the original engine and its operating environment (high-altitude turboprop), modification to a regenerative system for marine use appears feasible and attractive.

The redesigned engine has a maximum design-point thermal efficiency of 49% with a reduction in power output from the original engine of only 12.5%. The extend of the modifications to the original engine could be reduced somewhat to enhance economic attractiveness at the expense of reduced efficiency or power output. GRA

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N85-10071*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ACTIVE CONTROL TECHNOLOGY EXPERIENCE WITH THE SPACE SHUTTLE IN THE LANDING REGIME Final Report
Bruce G. Powers Oct. 1984 12 p refs Presented at the AGARD Flight Mech. Panel Symp. on Active Control Systems, Toronto, 15-18 Oct. 1984
(NASA-TM-85910; H-1260; NAS 1.15:85910) Avail: NTIS HC A02/MF A01 CSCL 01C

The shuttle program took on the challenge of providing a manual landing capability for an operational vehicle returning from orbit. Some complex challenges were encountered in developing the longitudinal flying qualities required to land the orbiter manually in an operational environmental. Approach and landing test flights indicated a tendency for pilot-induced oscillation near landing. Changes in the operational procedures reduced the difficulty of the landing task, and an adaptive stick filter was incorporated to reduce the severity of any pilot-induced oscillatory motions. Fixed-base, moving-base, and in-flight simulations were used for the evaluations, and in general, flight simulation was the only reliable means of assessing the low-speed longitudinal flying qualities problems. Overall, the orbiter control system and operational procedures have produced a good capability for routinely performing precise landings in a large, unpowered vehicle with a low lift-to-drag ratio. Author

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N85-10072 Department of the Air Force, Washington, D.C.
SINGLET DELTA OXYGEN GENERATOR Patent
J. D. Rockenfeller, inventor (to Air Force) Issued 24 Jul. 1984 10 p
(AD-D011208; US-Patent-4,461,756; US-Patent-Appl-SN-431436; US-Patent-Class-423-159) Avail: US Patent and Trademark Office CSCL 14/2

A method and apparatus for producing molecular oxygen in the excited singlet delta oxygen electronic state for use as an excited species reactant in a high energy, continuous-wave, chemically pumped laser. In this invention, small amounts of sodium hydroxide and hydrogen peroxide are continuously mixed, reacted, cooled and then combined with chlorine to form a mixture which is injected into a mixing chamber as very fine droplets to provide an efficient means for effecting a reaction which produces excited molecular oxygen. Author (GRA)

N85-10073# Systems Control, Inc., West Palm Beach, Fla.
HELIPORT SNOW AND ICE CONTROL METHODS AND GUIDELINES Final Report
J. B. McKinley and R. B. Newman Aug. 1984 61 p refs
(Contract DTFA01-80-C-10080)
(DOT/FAA-PM-84-22) Avail: NTIS HC A04/MF A01

Guidelines for snow and ice control on heliports are presented for the purpose of both enhancing the operational utility of heliports, and employing the unique capabilities of the rotorcraft to the maximum extent. These guidelines consider manual methods of snow and ice control such as plowing and chemical application, and automated methods through pavement heating systems. Cost and design considerations are provided for each system. Benefit/cost decision guidelines are provided with estimated annual operating cost data for 32 U.S. cities, and six snow and ice control methods. In addition, selection guidelines provide a methodology to assist heliport planners and designers with the selection of the most appropriate snow and ice control system. Author

N85-10074*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
YO-3A ACOUSTICS RESEARCH AIRCRAFT SYSTEMS MANUAL
J. L. Cross Jul. 1984 38 p
(NASA-TM-85968; A-9776; NAS 1.15:85968) Avail: NTIS HC A03/MF A01 CSCL 14B

The flight testing techniques, equipment, and procedures employed during air-to-air acoustic testing of helicopters using the NASA YO-3A Acoustic Research Aircraft are discussed. The research aircraft instrumentation system is described as well as hardware installation on the test aircraft and techniques used during the tests. Emphasis is placed on formation flying, position locations, test matrices, and test procedures. M.A.C.

N85-10075# National Aerospace Lab., Tokyo (Japan).
THE DATA PROCESSING SYSTEM OF THE NAL 2m X 2m TRANSONIC WIND TUNNEL
Seigou Nakamura, Koichi Suzuki, Masataka Shirai, Akira Koike, and Toshimi Fujita 1984 90 p
(NAL-TR-811; ISSN-0389-4010) Avail: NTIS HC A05/MF A01

The current data processing system of the NAL 2m x 2m Transonic Wind Tunnel is described. The system is based on dual ECLIPSE S/140 processors with a core memory of 128 KW x 2 at 16 bits/word. An outline of the main processing stages through which the test data cascade is first given, and then a description is given of the way in which force and moment data as well as pressure and temperature data are collected, processed, stored and displayed at each processing stage. Part of the hardware system used for the test data acquisition is also described when thought helpful in delineating the process of data reduction. Author

N85-10076# Naval Civil Engineering Lab., Port Hueneme, Calif.
HANGAR DESTRATIFICATION INVESTIGATION Technical Note, FY82 - FY83
J. Ashley Apr. 1984 42 p
(AD-A145049; NCEL-TN-1692) Avail: NTIS HC A03/MF A01 CSCL 13/1

Measurements made in military hangars indicated that stratification, the existence of a layer of hot air in a structure's overhead, is a typical phenomenon. Five destratification concepts (three commercial and two Navy-developed) were evaluated to determine the effectiveness and the adaptability of each concept for hangar applications. Only the Navy-developed concepts were found practical for hangar applications. Destratifier design and application guidelines were developed and are presented in the report. GRA

N85-10077# Strategic Air Command, Offutt AFB, Nebr. Aircraft Engineering Div.
AIRCRAFT CHOCKS Final Engineering Report
T. L. Fuchser 24 Jul. 1984 69 p
(AD-A145135; SAC/LGME-P-425) Avail: NTIS HC A04/MF A01 CSCL 01/5

A tire chock is the most common means to restrain an aircraft while it is parked. However, during certain ground operations, the chock is unable to restrain the aircraft. An analysis was

done on the restrain capabilities of the current chocks used for the B-52 and -135 aircraft. From this analysis, safety factors and operating limitations were established. In addition, criteria was developed for chock improvements as they are related to the various engineers on the B-52G, B-52H, KC-135A, KC-135E and KC-135R. Author (GRA)

N85-10078# Seville Training Systems Corp., Pensacola, Fla.
TRAINING EFFECTIVENESS EVALUATION AND UTILIZATION DEMONSTRATION OF A LOW COST COCKPIT PROCEDURES TRAINER Final Report, Jun. 1978 - Jul. 1982
P. W. Caro, W. E. Corley, W. D. Spears, and A. S. Blaiwes Jun. 1984 84 p
(Contract N61339-78-C-0113)
(AD-A145179; SEVILLE-TR-83-25; NAVTRAEQUIPC-78-C-0113-3) Avail: NTIS HC A05/MF A01 CSCL 05/9

The purpose of this study was to evaluate a prototype low cost cockpit procedures trainer (LCCPT) for the SH-3H aircraft. During Phase I of the study, pilots trained in the LCCPT were compared in subsequent SH-3H performance with a historical control group trained in Device 2C44, a much more expensive conventional cockpit procedures trainer. The LCCPT and 2C44 groups performed equally well in the SH-3H. For tasks practiced in the LCCPT, transfer of device training to SH-3H performance was 95 percent as estimated through a curve fitting technique. During Phase II, the adaptability of the LCCPT to student-directed instruction was evaluated. The students developed required levels of proficiency, and they appeared able to identify weaknesses in their performance and to direct their practice toward overcoming them. GRA

N85-10079# DCS Corp., Alexanderia, Va.
ANALYSIS OF ON-BOARD CIG (COMPUTER IMAGE GENERATOR) APPLICATIONS FOR AIRCREW TRAINING Final Technical Report, 1 Jul. 1983 - 30 Apr. 1984
D. B. Coblitz Orlando, Fla. NTEC Apr. 1984 107 p
(Contract N60921-82-D-A075)
(AD-A145214; DCS-LT0010; NAVTRAEQUIPC-IH-353) Avail: NTIS HC A06/MF A01 CSCL 09/2

This report presents the results of a study examining the potential use of on-board Computer Image Generation (CIG) for Naval aircrew training. Three criteria determine whether on-board CIG may be applied to a particular training task. The displays available in the cockpit must be suitable, generation of adequate imagery must be feasible, and the training problem must be appropriate. To determine each of these factors, surveys in each area were conducted. An analysis of the survey results is presented. The development and use of on-board CIG based training systems was concluded to be feasible and would enhance operational readiness. The report includes specific recommendations as regards training tasks that would benefit most from application of on-board CIG and would also be technically feasible. Three approaches to such application are: Utilization of existing and planned on-board hardware in training modes; Development of a training computer image generator as a pod to be mounted temporarily on a weapon station for training missions; Long term merging of training and tactical considerations in the development phase of a new weapon systems and avionics. All three approaches should be pursued in parallel. Author (GRA)

N85-10080# Canyon Research Group, Inc., Westlake Village, Calif.
CONTENT, VARIETY, AND AUGMENTATION OF SIMULATED VISUAL SCENES FOR TEACHING AIR-TO-GROUND ATTACK Final Interim Report, 1 Sep. 1981 - 31 Aug. 1984
G. Lintern, K. E. Thomley, B. E. Nelson, and S. N. Roscoe Orlando, Fla. NTEC Jul. 1984 90 p
(Contract N61339-81-C-0105)
(AD-A145218; NAVTRAEQUIPC-81-C-0105-3) Avail: NTIS HC A05/MF A01 CSCL 19/5

The Visual Technology Research Simulator was used for quasi-transfer-of-training study in which 32 military pilots were taught to deliver bombs from a 30-degree dive. Sixteen of the pilots had a moderate amount of prior bombing experience (approximately 60 bombing runs) and the remainder had none. The pilots were given 80 training trials in the simulator under specific training conditions. Three factors were manipulated in training; those being level of detail in the visual scene, number of visual scenes, and augmented feedback in the form of artificial visual guidance. Differential transfer effects were assessed on the basis of performances on 30 transfer trials in the simulator. The transfer phase used a variety of visual scenes and varying levels of detail but no augmented feedback. All subjects flew the same set of conditions in the transfer phase. The scene-content issue is one of the most crucial for modern training simulators. These data are the first to show that scene content affects learning of flight skills. Simulator training of air-to-ground attack should be conducted with visual scenes that have features similar to those of our landscape. Variety was raised as a training issue. Augmented feedback proved to be helpful to inexperienced and more experienced pilots with their dive altitude control. It appears to be useful at least for primary and intermediate instruction. There is no evidence in this report that pilots with no experience in air-to-ground attack should be treated differently during training to pilots who have some experience in air-to-ground attack. GRA

N85-10081# Department of the Air Force, Washington, D.C.
AIRCRAFT CABIN PRESSURIZATION CONTROL SYSTEM TESTER Patent Application
K. J. Werling, inventor (to Air Force) Filed 19 Jun. 1984 16 p
(AD-D011225; US-Patent-Appl-SN-622047) Avail: NTIS HC A02/MF A01 CSCL 14/2

This patent application discloses an aircraft cabin pressure control system tester, including a first tester component having a vacuum pressure-sensing gage which indicates the static atmosphere in inches of Hg and a second tester component having a differential pressure-sensing gage which indicates the pressure/vacuum in inches of H2O. When the components of the tester are connected respectively in communication with lines connecting the controller of the system to static atmosphere ports and a pressure regulator valve, the tester can be used to determine which one, if any, of the pressure controller, air compressor and regulator valve of the pressure control system is faulty. GRA

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N85-10082# Science Council of Japan, Tokyo. National Committee on Space Research.
SPACE RESEARCH IN JAPAN. NATIONAL REPORT
Atsuhiro Nishida, ed., Yoshiaki Ogawara, ed., Mikio Shimizu, ed., and Kazuo Takayanagi, ed. Inst. of Space and Astronautical Science May 1984 83 p refs Presented at the 25th Meeting of the ICSU Comm. on Space Res., Graz, Austria, 25 Jun. - 7 Jul. 1984 Original contains color illustrations
Avail: NTIS HC A05/MF A01

Satellite observations; rocket observations; SEPAC (space experiments with particle accelerators); balloon observations; scientific activities in space research; and bibliography of space science are discussed. For individual titles, see N85-10083 through N85-10086.

N85-10083# Science Council of Japan, Tokyo.
SATELLITE OBSERVATIONS c15
In its Space Res. in Japan May 1984 p 3-24 (For primary document see N85-10082 01-12)
Avail: NTIS HC A05/MF A01

In 1982 and 1983, six scientific satellites were operated successfully. Two of them, JIKIKEN and ISS-b, performed observations of the Earth's plasma environment. HINOTORI, the solar maximum satellite, observed a number of solar flares. HAKUCHO and newly launched TENMA conducted various observations of cosmic X-ray sources. HIMAWARI-2 is a meteorological satellite

but its payload includes a solar particle monitor. EXOS-C was successfully launched in February, 1983, and participants in the MAP (Middle Atmosphere Program). Following these missions, the PLANET-A project comprising two missions, MS-T5 and PLANET-A, is under preparation for the participation in the international cooperative exploration of Comet P/Halley. The third X-ray astronomy satellite ASTRO-C is currently scheduled for 1987 launch. Author

N85-10084# Science Council of Japan, Tokyo.
ROCKET OBSERVATIONS c15
In its Space Res. in Japan May 1984 p 25-39 (For primary document see N85-10082 01-12)
Avail: NTIS HC A05/MF A01

The Institute of Space and Astronautical Science (ISAS) sounding rocket experiments were carried out during the periods of August to September, 1982, January to February and August to September, 1983 and January to February, 1984 with sounding rockets. Among 9 rockets, 3 were K-9M, 1 was S-210, 3 were S-310 and 2 were S-520. Two scientific satellites were launched on February 20, 1983 for solar physics and on February 14, 1984 for X-ray astronomy. These satellites were named as TENMA and OHZORA and designated as 1983-011A and 1984-015A, respectively. Their initial orbital elements are also described. A payload recovery was successfully carried out by S-520-6 rocket as a part of MINIX (Microwave Ionosphere Non-linear Interaction Experiment) which is a scientific study of nonlinear plasma phenomena in conjunction with the environmental assessment study for the future SPS project. Near IR observation of the background sky shows a more intense flux than expected possibly coming from some extragalactic origin and this may be related to the evolution of the universe. US-Japan cooperative program of Tether Experiment was done on board US rocket. Author

N85-10085# Science Council of Japan, Tokyo.
SEPAC (SPACE EXPERIMENTS WITH PARTICLE ACCELERATORS)
In its Space Res. in Japan May 1984 p 40-44 (For primary document see N85-10082 01-12)
Avail: NTIS HC A05/MF A01

Space Experiments with Particle Accelerators: SEPAC was carried out by the Spacelab-1 (STS-9) on November 28 to December 8, 1983, which was one of the first international cooperative scientific experiments using the Space Shuttle. The purpose of SEPAC experiment is to carry out active and interactive experiments on and in the Earth's upper atmosphere and magnetosphere, outer space being used as a gigantic laboratory to perform the variety of experiments of space plasma physics. In particular, the following were immediate scientific objectives to study: vehicle charge build up and its neutralization; beam plasma physics; and beam atmosphere interactions. Author

N85-10086# Science Council of Japan, Tokyo.
BALLOON OBSERVATIONS c02
In its Space Res. in Japan May 1984 p 45-51 (For primary document see N85-10082 01-12)
Avail: NTIS HC A05/MF A01

Seventeen balloon observations were carried out in May to June and September to October, 1982, and eight observations were made in August to Septem.ber in 1983. These balloons were launched from the Sanriku Balloon Center (39.2 N, 141.8 E), in Japan, which was established in 1971. The flight operations were conducted by the balloon team of the institute of Space and Astronautical Science. Besides these observations, five balloon observations were carried out at Alice Springs in May, 1983, in Collaboration with Australian group. Two flights were performed at the time of eclipse, June, 1983, in Indonesia in collaboration with balloon groups in Lapan, Indonesia. Balloon observations were made in the fields of astrophysics, cosmic ray physics, geophysics and atmospheric science. The observations were made for scientists of other institutions and universities as well as for the research groups of ISAS. Author

N85-10087*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
RESULTS OF THE TECHNICAL EXCHANGE AGREEMENT BETWEEN NASA AND DUPONT ON THE CONTAINERLESS DROP TUBE SOLIDIFICATION OF NIAl3
Edwin C. Ethridge, Peter A. Curreri, and Michael Kelly (Du Pont de Nemours (E. I.) and Co., Wilmington, Delaware) Oct. 1984 46 p refs
(NASA-TM-86473; NAS 1.15:86473) Avail: NTIS HC A03/MF A01 CSCL 22A

The final results of the Drop Tube Solidification of NiAl3 are presented. Problems associated with the utilization of a dripper furnace in the drop tube are discussed and the modification of experimental procedures required to achieve results are described. Sample microstructures of drop tube samples are compared with other samples. The dendrite arm spacings of drop tube samples are correlated with the rapid cooling rates. M.A.C.

N85-10088# Committee on Commerce, Science, and Transportation (U. S. Senate).
SOVIET SPACE PROGRAMS, 1976-1980, WITH SUPPLEMENTARY DATA THROUGH 1983. PART 2: MANNED SPACE PROGRAMS AND SPACE LIFE SCIENCES
Marcia S. Smith, Alfred Hellman, and Christopher H. Dodge Washington GPO Oct. 1984 313 p refs Presented to the Subcomm on Sci. Technol. and Space of the Comm. on Com., Sci. and Transportation, 98th Congr., 2d Sess., 3 Feb. 1984 Prepared by the Library of Congr., Congr. Res. Serv. 3 Vol.
(S-Rept-98-235-Pt-2; GPO-32-985) Avail: Subcommittee on Science, Technology and Space

Soviet manned space programs are discussed. The Soviet quest for a permanently manned presence in space is reviewed. Also included is information concerning the physiological and psychological findings to the extended duration of Soviet manned flights. R.J.F.

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

No abstracts in this category.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

N85-10089*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
NATURAL ENVIRONMENT DESIGN CRITERIA FOR THE ADVANCED X-RAY ASTROPHYSICS FACILITY (AXAF) DEFINITION AND PRELIMINARY DESIGN
William M. Greene and William W. Vaughan Washington Nov. 1984 15 p
(NASA-TM-86481; NAS 1.15:8648*) Avail: NTIS HC A02/MF A01 CSCL 14B

This document provides the natural environment design criteria requirements for use in the Advanced X-Ray Astrophysics Facility (AXAF) definition and preliminary design studies. The atmospheric dynamic and thermodynamic environments, meteoroids, radiation, magnetic fields, and physical constants are all addressed. This information will enable all groups involved in the definition and

preliminary design studies to proceed with a common and consistent set of natural environment criteria requirements. B.W.

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N85-10090 Bayerische Akademie der Wissenschaften, Munich (West Germany). Geodaetische Kommission.
DIAGNOSIS AND THERAPY OF GEODETIC SATELLITE NETWORKS OF DOPPLER TYPE Ph.D. Thesis - Stuttgart Univ. [DIAGNOSE UND THERAPIE VON GEODAETISCHEN SATELLITENNETZEN VON TYP DOPPLER]
Alfred Kleusberg 1984 111 p refs In GERMAN
(Ser-C-293; ISBN-3-7696-9343-4; ISSN-0065-5325) Copyright. Avail: Issuing Activity

The different sources of errors influencing the accuracy of geodetic point determination are localized and qualitatively described in an analysis of Doppler satellite networks. The error quantities for absolute and relative coordinates determined by Doppler measurements are given. Possibilities to enhance the accuracy in the reference system, ephemerides determination, and evaluation of Doppler measurements are discussed. For ephemerid determination, the rotational and translational equations of motions to be integrated for satellites of any structure are given. The gravitational part of the force acting on satellites is described by a representation of the gravitational potential using Cartesian basic functions. The models for Doppler measurement evaluation are based on a free Doppler network compensation. The a priori knowledge about ephemerides, refraction, etc., is taken into account in this compensation. Author (ESA)

N85-10091*# Universities Space Research Association, Boulder, Colo. Atmospheric Processes Office.
EXPLORATORY INVESTIGATION OF THE NEED FOR AND FEASIBILITY OF A LOWER ATMOSPHERE RESEARCH SATELLITE (LARS) PROGRAM
14 Oct. 1980 42 p refs
(Contract NAS8-33730)
(NASA-CR-171181; NAS 1.26:171181) Avail: NTIS HC A03/MF A01 CSCL 22A

The need for and feasibility of a research satellite program for the intensive study of the lower atmosphere (the troposphere and lower stratosphere) is discussed. The priorities for scientific investigation of the lower atmosphere during the next decade are examined. The findings of the study are concerned with identification of those broad research issues of highest priority and, in particular, with those that are most appropriate for investigation from space platforms. M.A.C.

N85-10092# Department of the Army, Washington, D. C.
LIGHTWEIGHT COMPOSITE LAUNCHER POD Patent Application
L. D. Hoffmeister and R. J. Thompson, inventors (to Army) Filed 20 Aug. 1984 14 p
(AD-D011236; US-Patent-Appl-SN-642850) Avail: NTIS HC A02/MF A01 CSCL 19/7

This patent application discloses a lightweight composite launcher pod which includes a multiplicity of elongated launcher tubes that are accurately aligned in a composite material with the composite material having four outer sides with alignment surfaces on three of the sides and bearing and alignment surfaces on the other side, and the lightweight composite launcher pod being capable of serving as the shipping and storage container for rockets before launching of the rockets as well as for launching the rockets therefrom when mounted in a launcher structure. GRA

N85-10093# Department of the Air Force, Washington, D.C.
ZERO ADHESION SYSTEM Patent Application
J. M. Steinmetz, Jr., inventor (to Air Force) Filed 25 Jun. 1984 9 p
(AD-D011237; US-Patent-Appl-SN-623873) Avail: NTIS HC A02/MF A01 CSCL 16/4

This patent application discloses a zero adhesion system whereby a protective missile launch pad is held against an EPM-coated missile skin surface having an intermediary cloth sheet thereinbetween. The pad comprises a steel sheet having perforated cleats defined therein, which sheet is affixed to the underside of the pad and releasably bears against the intermediary cloth sheet. This arrangement operates such that the protective missile launch pad is freely released from the missile at launch without adhesion to the EPM-coated missile skin. GRA

N85-10094# Physics Lab. RVO-TNO, The Hague (Netherlands). Researchgroep 1: Fysica.
SATELLITE RECONNAISSANCE
G. P. deLoor Jun. 1984 27 p refs Partly in DUTCH and ENGLISH
(Contract A83/K/075)
(AD-B085034; PHL-1984-41; TDCK-79367) Avail: NTIS HC A03/MF A01

The potential of the observation equipment in remote sensing satellites is described. United States meteorology, land use and oceanography satellites and the major US Earth observation programs are listed. Imaging satellite systems are described such as: visible light and near infrared, thermal IR window, and microwave window. It is concluded that a geometrical resolution between 10 and 40 m can be expected. In order to reduce the data flow from the satellite system the input side of the system (the object-sensor interaction) has to be known. Satellites with synthetic aperture radar are increasingly important, but satellites can never fully replace observations with aircraft and drones. Author (ESA)

N85-10095# Massachusetts Inst. of Tech., Cambridge.
DIRECTED ENERGY MISSILE DEFENSE IN SPACE
Ashton B. Carter Apr. 1984 97 p refs
(PB84-210111; OTA-BP-ISC-26; LC-84-601052) Avail: NTIS HC A05/MF A01 CSCL 15C

Current concepts for directed-energy ballistic missile defense in space are described and assessed. Its purpose is to provide Members of Congress, their staffs, and the public with a readable introduction to the so-called Star Wars technologies that some suggest might form the basis of a future nationwide defense against Soviet nuclear ballistic missiles. Since these technologies are a relatively new focus for U.S. missile defense efforts, little information about them has been readily available outside the expert community. Author (GRA)

N85-10083# Science Council of Japan, Tokyo.
SATELLITE OBSERVATIONS
In its Space Res. in Japan May 1984 p 3-24 (For primary document see N85-10082 01-12)
Avail: NTIS HC A05/MF A01

N85-10084# Science Council of Japan, Tokyo.
ROCKET OBSERVATIONS
In its Space Res. in Japan May 1984 p 25-39 (For primary document see N85-10082 01-12)
Avail: NTIS HC A05/MF A01

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N85-10096* Chrysler Corp., New Orleans, La.
RESULTS OF TESTS OF ADVANCED FLEXIBLE INSULATION VORTEX AND FLOW ENVIRONMENTS IN THE NORTH AMER-

ICAN AERODYNAMICS LABORATORY LOWSPEED WIND TUNNEL USING 0.0405-SCALE SPACE SHUTTLE ORBITER MODEL 16-0 (TEST OA-309)
B. A. Marshall (Rockwell International Corp., Downey, Calif.) and M. E. Nichols (Rockwell International Corp., Downey, Calif.) Sep. 1984 118 p ref
(Contract NAS9-16283)
(NASA-CR-167692; NAS 1.26:167692; DMS-DR-2519) Avail: NTIS HC A06 CSCL 22B

An experimental investigation (Test OA-309) was conducted using 0.0405-scale Space Shuttle Orbiter Model 16-0 in the North American Aerodynamics Laboratory 7.75 x 11.00-foot Lowspeed Wind Tunnel. The primary purpose was to locate and study any flow conditions or vortices that might have caused damage to the Advanced Flexible Reusable Surface Insulation (AFRSI) during the Space Transportation System STS-6 mission. A secondary objective was to evaluate vortex generators to be used for Wind Tunnel Test OS-314. Flowfield visualization was obtained by means of smoke, tufts, and oil flow. The test was conducted at Mach numbers between 0.07 and 0.23 and at dynamic pressures between 7 and 35 pounds per square foot. The angle-of-attack range of the model was -5 degrees through 35 degrees at 0 or 2 degrees of sideslip, while roll angle was held constant at zero degrees. The vortex generators were studied at angles of 0, 5, 10, and 15 degrees. Author

N85-10401*# Rockwell International Corp., Downey, Calif.
STRUCTURAL ANALYSIS OF THE SPACE SHUTTLE ORBITER
Henry R. Grooms and James H. Johnson, Jr. *In* NASA. Langley Research Center Res. in Struct. and Dyn., 1984 Oct. 1984 p 369-383 refs (For primary document see N85-10377 01-39)
Avail: NTIS HC A18/MF A01 CSCL 22B

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

N85-10097# National Bureau of Standards, Boulder, Colo. Electromagnetic Fields Div.
AN ERROR ANALYSIS FOR THE USE OF PRESENTLY AVAILABLE LUNAR RADIO FLUX DATA IN BROADBEAM ANTENNA-SYSTEM MEASUREMENTS
William C. Daywitt Feb. 1984 39 p refs
(PB84-218361; NBS-TN-1073) Avail: NTIS HC A03/MF A01; also available SOD CSCL 09F

Simple, precise expressions for lunar diameter, average brightness temperature, flux density, and shape factor are presented. An analysis of the relationship between these parameters and corresponding errors are included. For broadbeam (HPBW > d) antennas, results show that flux density and shape factor can be determind with errors less than 13 percent and 0.4 percent respectively at frequencies below 10 GHz. Extension of the analysis to higher frequencies is indicated. Author (GRA)

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N85-10098*# Bendix Corp., Teterboro, N.J. Guidance Systems Div.
MODULAR DESIGN ATTITUDE CONTROL SYSTEM Final Report, 1 Oct. 1983 - 31 Aug 1984
F. D. Chichester 5 Oct. 1984 79 p refs
(Contract NAS8-33979)
(NASA-CR-171182; NAS 1.26:171182) Avail: NTIS HC A05/MF A01 CSCL 22B

A sequence of single axismodels and a series of reduced state linear observers of minimum order are used to reconstruct inaccessible variables pertaining to the modular attitude control of a rigid body flexible suspension model of a flexible spacecraft. The single axis models consist of two, three, four, and five rigid bodies, each interconnected by a flexible shaft passing through the mass centers of the bodies. Modal damping is added to each model. Reduced state linear observers are developed for synthesizing the inaccessible modal state variables for each modal model.
M.A.C.

N85-10099# Spectra Research Systems, Inc., Huntsville, Ala.
RESEARCH ON LARGE, HIGHLY ACCURATE, INFLATABLE REFLECTORS Final Report, 30 Sep. 1983 - 30 May 1984
R. Bradford Jul. 1984 97 p
(Contract F04611-83-C-0053)
(AD-A145080; SRS-TR84-015-CU40; AFRPL-TR-84-040) Avail: NTIS HC A05/MF A01 CSCL 13/8

Very large and accurate reflective surfaces are required for future space applications such as solar rocket propulsion, radar, laser power transmission and relay, solar energy collection, telescopes, and others. Present techniques used to construct highly accurate reflectors are limited in application to diameters of a few meters. Metallized thin film membranes have the potential to satisfy the requirements of most future applications with minimum weight systems. The objective of this research was to identify materials, construction and control techniques to improve the surface accuracy of inflatable reflectors. Film joining and forming, support structure design options, surface accuracy measurement system options and electrostatic surface configuration control techniques were investigated. Prototype models were designed, built, and tested to demonstrate film forming techniques, support structure deployment, and electrostatic membrane configuration control utilizing segmented charge plates and an electron gun. A laser ray-tracing technique was employed to measure surface accuracies. These demonstrations verified the feasibility of the concepts.
Author (GRA)

N85-10672# Committee on Appropriations (U. S. Senate).
OFFICE OF TECHNOLOGY ASSESSMENT
In its Department of Housing and Urban Development and Certain Independent Agencies Appropriations for Fiscal Year 1985, Pt. 2 1984 p 1233-1241 Washington GPO (For primary document see N85-10670 01-84)
Avail: Committee on Appropriations

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N85-10100*# Auburn Univ., Ala. Dept. of Computer Sciences.
SINGULAR ASYMPTOTIC EXPANSIONS IN NONLINEAR ROTORDYNAMICS
William B. Day 10 Aug. 1984 24 p refs
(Grant NGT-01-002-099)
(NASA-CR-174012; NAS 1.26:174012) Avail: NTIS HC A02/MF A01 CSCL 21H

During hot firing ground testing of the Space Shuttle's Main Engine, vibrations of the liquid oxygen pump occur at frequencies which cannot be explained by the linear Jeffcott model of the rotor. The model becomes nonlinear after accounting for deadband, side forces, and rubbing. Two phenomena present in the numerical solutions of the differential equations are unexpected periodic orbits of the rotor and tracking of the nonlinear frequency. A multiple scale asymptotic expansion of the differential equations is used to give an analytic explanation of these characteristics. M.A.C.

N85-10101*# National Aeronautics and Space Administration, Washington, D. C.
DEVELOPMENT OF THE ENGINEERING TEST SATELLITE-3 (ETS-3) ION ENGINE SYSTEM
S. Kitamura Jul. 1984 385 p refs Transl. into ENGLISH of rept. DS-114166 National Space Development Agency of Japan, Tokyo, Mar. 1983 p 1-206 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77538; NAS 1.15:77538) Avail: NTIS HC A17/MF A01 CSCL 21C

The ion engine system onboard the ETS-3 is discussed. The system consists of two electron bombardment type mercury ion engines with 2 mN thrust and 2,000 sec specific impulse and a power conditioner with automatic control functions. The research and development of the system, development of its EM, PM and FM, the system test and the technical achievements leading up to final launch are discussed. B.W.

N85-10102# Aerojet Techsystems Co., Sacramento, Calif.
COLUMBIUM CHAMBER FABRICATION STUDY Final Report, Oct. 1983 - Mar. 1984
V. Frick Jul. 1984 66 p
(Contract F04611-83-C-0057; AF Proj. 3058)
(AD-A145230; AFRPL-TR-84-028) Avail: NTIS HC A04/MF A01 CSCL 21/8

In order to achieve high performance in a compact envelope, some Advanced Pump-Fed engines must operate at high chamber pressure while maintaining high component efficiencies. The most significant technology advancement required to bring this engine concept to reality is cooling of the combustion chamber under these conditions. The leading candidate chamber cooling system makes use of a chamber regeneratively cooled with N204 oxidizer. Columbium (Niobium) is one of the candidate materials being considered for the chamber. It has the physical and thermal properties required for cooling and structural integrity, and is compatible with the corrosive N204 in the normal engine operating environment. The chamber design approach employs a machined columbium alloy liner with rectangular slots milled onto its exterior. After filling the slots with a removable filler material, they are closed out with pure columbium using the Chemical Vapor Deposition (CVD) process to enclose and form the coolant passages. GRA

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N85-10103 Gesellschaft fuer Strahlen- und Umweltforschung m.b.H., Munich (West Germany).
COMPILATION OF DATA SOURCES FOR EXISTING CHEMICALS
Kristina Voight and Hans Rohleder Apr. 1984 121 p refs Presented at 3rd OECD Expert Groups 3rd and 4th Meeting, Ottawa, 15-18 May 1984
(GSF-A-2/84; OECD-Doc-EXC/III/IV/84.36; ISSN-0721-1694)
Copyright. Avail: Issuing Activity

Over 320 data sources giving information on chemicals of interest for environmental and/or human health hazard studies are listed. Author (ESA)

N85-10104*# HC Chem Research and Service, San Jose, Calif.
DEVELOPMENT OF NEW AND IMPROVED POLYMER MATRIX RESIN SYSTEMS, PHASE 1
M. S. Hsu Dec. 1983 72 p refs
(Contract NAS2-11529)
(NASA-CR-166595; NAS 1.26:166595) Avail: NTIS HC A04/MF A01 CSCL 11B

Vinylstilbazole (vinylstyrylpyridine) and vinylpolystyrylpyridine were prepared for the purpose of modifying bismaleimide composite resins. Cure studies of resins systems were investigated by differential scanning calorimetry. The vinylstyrylpyridine-modified bismaleimide composite resins were found to have lower cure and gel temperatures, and shorter cure times than the corresponding unmodified composite resins. The resin systems were reinforced with commercially avialable satin-weave carbon cloth. Prepregs were fabricated by solvent or hot melt techniques. Thermal stability, flammability, moisture absorption, and mechanical properties of the composites (such as flexural strength, modulus, tensile and short beam shear strength) were determined. Composite laminates showed substantial improvements in both processability and mechanical properties compared to he bismaleimide control systems. The vinylstyrylpyridine modified bismaleimide resins can be used as advanced matrix resins for graphite secondary structures where ease of processing, fireworthiness, and high temperature stability are required for aerospace applications. Author

N85-10105*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DYNAMICS OF GRAPHITE FIBER INTERCALATION: IN SITU RESISTIVITY MEASUREMENTS WITH A FOUR POINT PROBE
Donald A. Jaworske 1984 14 p refs Presented at the Mater. Res. Soc. Symp. on Intercalated Graphite, Boston, 28-30 Nov. 1984; sponsored by American Physical Society
(NASA-TM-86858; E-2321; NAS 1.15:86858) Avail: NTIS HC A02/MF A01 CSCL 11D

The dynamics of ferric chloride intercalation of single graphite fibers were studied, in situ, using a four point dc bridge. Measurements before, during and after the intercalation showed that the intercalation occurred within minutes at 200 C. Changes in fiber resistivity after exposure to air suggested hydration of the graphite intercalation compound. Deintercalation of the ferric chloride was initiated at temperatures in excess of 400 C. cycling the intercalant into and out of the graphite fiber gave no improvements in fiber resistivity. The activation energy of the ferric chloride intercalation reaction was found to be 17 + or - 4 kcal/mol 1 consistent with the concept of a preliminary nucleation step in the intercalation reaction. Author

N85-10106# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A METHOD FOR OBTAINING NEW CYCLICAL IMIDES OF DERIVATIVE BENZIMIDAZOLES
L. Konopski and B. Serafinowa 26 Jul. 1984 9 p Transl. into

ENGLISH of Polish Patent no. 109420 (26 Feb. 1979) p 1-3
(AD-A145042; FTD-ID(RS)T-0788-84) Avail: NTIS HC A02/MF A01 CSCL 07/3

A method for the synthesis of cyclical imides condensed from benzimidazol rings is described. The product compounds include 1-carboethoxy methylo-2-cyano benzimidazol, 1-(2-cyanoetylo)-2-cyano benzimidazol, 3.5 diketoperhydro-1,4-diazepino(1,2-A) benzimidazol, and others. The new compounds effect a biological activity. Given orally to mice in dosages of 200 mg/kg they counteracted reserpine hypothermy and prolonged the duration of amphetamine stereotype in rats. Moreover the compounds inhibited further development of stomach ulcers caused by a four hour immobilization and cooling. M.G.

N85-10107# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
METHOD OF OBTAINING POLYCHALCONES
S. V. Tsukerman, E. V. Danilchenko, and V. F. Lavrushin 9 Aug. 1984 6 p Transl. into ENGLISH from Russian Patent no. 376402
(AD-A145051; FTD-ID(RS)T-0797-84) Copyright. Avail: NTIS HC A02/MF A01 CSCL 07/3

A method of obtaining polychalcones by means of the reaction of polycondensation of dialdehydes and diketones in a medium of a solvent with heating in the presence of a solution of a strong base is described. For the purpose of obtaining products with a high degree of uniformity the reaction is conducted at 240 to 250 C and the intermediate products of the reaction are subjected to dehydration by boiling with acetic anhydride. Aliphatic-aromatic or heterocyclic dialdehydes and diketones are used as the initial products. Diethylene glycol is used as the solvent. M.G.

N85-10108# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
METHOD OF OBTAINING POLYBENZIMIDAZOPYRROLONES
V. V. Korshak, A. L. Rusanov, and R. D. Katsarava 9 Aug. 1984 5 p Transl. into ENGLISH of Russian Patent no. 339558 (24 May 1972) p 1-2
(AD-A145140; FTD-ID(RS)T-0796-84) Copyright. Avail: NTIS HC A02/MF A01 CSCL 07/3

A method to obtain polybenzimidazopyrrolones by interaction of dianhydrides of tetracarboxylic acids with tetraamines in a solution with subsequent treatment of the polyaminoamido acid obtained with acetic anhydride with heating is presented. The purpose of the method is to obtain a soluble linear polymer. The product obtained is successively heated in polyphosphoric acid at 200 C, subjected to hydrolysis and treated with acetic anhydride with heating. E.A.K.

N85-10109# Washington State Univ., Pullman. Dept. of Civil and Environmental Engineering.
EFFECT OF TOLUENE ON THE SOLUBILITY OF BIOHAZARDOUS VOLATILE SYNTHETIC ORGANIC COMPOUNDS Final Report, 1 Jun. 1983 - 31 May 1984
E. Hindin 31 Jul. 1984 38 p
(Grant AF-AFOSR-0175-83)
(AD-A145188; AFOSR-84-0760TR) Avail: NTIS HC A03/MF A01 CSCL 07/3

The solubility of toluene, benzene, 1,1,2, trichloroethylene and p-cresol singly in high purity water at 20 degrees C was determined under dynamic and static conditions. Toluene present in an aqueous solutions enhanced the benzene solubility, decreased the time for solubility to be attained and increased the rate at which solubility was attained. Toluene present in the water caused little difference in the time for 1,1,2 trichloroethylene to reach solubility equilibrium, but caused a more rapid rate in attaining solubility equilibrium and increased the solubility equilibrium concentration. The effect of toluene on the solubility kinetics of p-cresol was to reduce the time in attaining solubility equilibrium, increase the rate in achieving solubility equilibrium and caused little change in the solubility concentration. Author (GRA)

N85-10110# Joint Publications Research Service, Arlington, Va.
USSR REPORT: MATERIALS SCIENCE AND METALLURGY, NO. 93
25 Nov. 1983 66 p refs Transl. into ENGLISH from various Russian articles
(JPRS-84810) Avail: NTIS HC A04

News items, abstracts, and articles of scientific reports on aspects of materials science and metallurgy are covered including aluminum and its alloys; coatings; corrosion; ferrous metallurgy; forming; glass and ceramics; powder metallurgy; refractory materials; steels; thin films, titanium; and welding. For individual titles, see N85-10111 through N85-10127.

N85-10111# Joint Publications Research Service, Arlington, Va.
EFFECT OF SCANDIUM ON THE STRUCTURE AND PROPERTIES OF Al-Zn-Mg ALLOYS Abstract Only c26
V. I. Yelagin, V. V. Zakharov, A. A. Petrova, and Ye. V. Vyshegorodtseva *In its* USSR Rept.: Mater. Sci. and Met., No. 93 (JPRS-84810) 25 Nov. 1983 p 1 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Metally (Moscow), no. 4, Jul. - Aug. 1983 p 180-183 (For primary document see N85-10110 01-23)
Avail: NTIS HC A04

The durability of industrial Al-Zn-Mg alloys does not exceed 40-45 kg/sq mm, and attempts to increase it by increasing zinc and magnesium content lead to increased corrosive fracturing. Results of adding scandium at the eutectic conversion temperature of 655 C are presented. Samples of the new alloy produced by semicontinuous casting and homogenization at 460, 500, and 600 C, followed by tempering in water, were examined for secondary particles containing scandium. Subsequent analysis of mechanical properties showed that scandium, especially in combination with manganese as an alloying agent, had superior durability to those alloyed using manganese as an alloying agent, and those alloyed using manganese and zirconium. The original Al-Zn-Mg alloy showed a fully recrystallized structure which was not found with either scandium or scandium-manganese additives; the manganese-zirconium variant had a mixed structure. Thus scandium was judged to be a promising additive for production of more durable, corrosion resistant and thermally stable Al-Zn-Mg alloys. Author

N85-10112# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF ALUMINUM METALLIZATION COATINGS ON CORROSION FATIGUE PROPERTIES OF STEEL Abstract Only c26
I. N. Katkov, I. P. Pistun, A. B. Kuslitskiy, M. A. Glevoba, and V. N. Kovlenko *In its* USSR Rept.: Mater. Sci. and Met., No. 93 (JPRS-84810) 25 Nov. 1983 p 5-6 Transl. into ENGLISH from Zashchita Metallov (Moscow), v. 19, no. 4, Jul. - Aug. 1983 p 596-598 (For primary document see N85-10110 01-23)
Avail: NTIS HC A04

Cylindrical specimens of OKh18N10T steel with gage section diameter 10 mm were studied for multicycle fatigue in pure flexure and bending of the specimens at 3000 cycles per minute in air an in 3.5% NaCl. The test base was 10 to the 7th power cycles in air, 2 x 10 to the 7th power cycles in the corrosive medium. Short cycle endurance testing of type 45GI7Yu3 steel was performed with specimens 5 mm thick, 12 KhNZA steel 25 mm thick under severe loading in the same media. Load application frequency was 10 cycles per minute, relative deformation 0.6%. The results of the testing showed that metallization with aluminum increases the corrosion fatigue strength of OKh18N10T steel. Shot peening with cast iron shot slightly increased the fatigue limit of the steel both in air and in the corrosive medium. Metallization decreased the harmful influence of the corrosive medium in long term fatigue testing. The short term fatigue testing indicated that metallization with aluminum increased the durability of a specium with stress concentrators, decreasing the negative influence of the salt solution on steel specimens. Author

N85-10113# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF PARAMETERS OF ALUMIMUN ALLOY ANODIZING PROCESS ON OXIDE COATING THICKNESS Abstract

Only c26
A. V. Karlashov, L. N. Kosinskaya, Yu. P. Masyuk, and A. D. Gnatyuk *In its* USSR Rept.: Mater. Sci. and Met., No. 93 (JPRS-84810) 25 Nov. 1983 p 6 Transl. into ENGLISH from Zashchita Metallov (Moscow), v. 19, No. 4, Jul. - Aug. 1983 p 570-573 (For primary document see N85-10110 01-23)
Avail: NTIS HC A04

The influence of technological parameters in the process of anodizing type 1420 alloy in a sulfuric acid solution on the thickness of the coating produced was analyzed by means of a second order regression model. A quasi-D-optimal rotatable box plan on a sphere was used to construct the basic model. The independent variables used included concentration of electrolyte, current density, electrolyte temperature and anodizing time. The anodizing process was performed with constant current density in a 44 cubic dm bath. The cathodes were lead plates. The solution was mixed by a mechanical stirrer in the center of the bath. The results showed that under the experimental conditions the influence of the primary technological parameters on thickness of the coating produced is described by a second order equation with a high degree of accuracy over a broad range of change. Maximum effectiveness is achieved at electrolyte temperature 18 C, concentration 190 g/1. Author

N85-10114# Joint Publications Research Service, Arlington, Va.
NEW FERROUS METALLURGY TECHNOLOGY Abstract Only c26
In its USSR Rept.: Mater. Sci. and Met., No. 93 (JPRS-84810) 25 Nov. 1983 p 7-11 Transl. into ENGLISH from Ekon. Gazeta (Moscow), no. 34, Aug. 1983 p 2 (For primary document see N85-10110 01-23)
Avail: NTIS HC A04

Steel production is to be increased by developing oxygen process conversion and electric furnace methods, and expanding steel production through special smelting and out-of-furnace processing. Research and pilot conversion carried out by scientific research institutes showed the high level of technical efficiency attained by the conversion processes with combined blow-through. While in the conventional design oxygen enters only from above, in the new method process gases are introduced from below and also from the top through tuyeres. Inert gases or oxygen can also be introduced from below, with oxygen supplied from above for blow-through and mixture with natural gas for furnace preheating. Combined blow-through makes it possible to adjust the flow rates of the molten pig iron. In addition, when the open-hearth method is replaced, it is possible to retain the proportion of molten pig iron to scrap utilized in the plant. B.G.

N85-10115# Joint Publications Research Service, Arlington, Va.
THERMAL FATIGUE OF GAS TURBINE ENGINE BLADES MADE OF MATERIAL BASED ON SILICON NITRIDE AND SILICON CARBIDE Abstract Only c26
G. N. Tretyachenko, B. S. Karpinos, and B. D. Kosov *In its* USSR Rept.: Mater. Sci. and Met., No. 93 (JPRS-84810) 25 Nov. 1983 p 16 Transl. into ENGLISH from Probl. Prochnosti (Kiev), no. 7, Jul. 1983 p 9-12 (For primary document see N85-10110 01-23)
Avail: NTIS HC A04

The strength of ceramic turbine engine blades in relation to thermal stress and static strength features of the materials used, Si3N4(59.1%)+SiC(39.4%)+MgO(1.47%), at 140, 180 and 220 MPa was studied. Effects of various temperatures up to 1373 K were registered on chrome-aluminum thermocouple meters and on tungsten-rhenium meters at 1373 to 1773 K, with the meters attached at diamond-cut grooves in key locations of the blades. Results showed a regular dependence of strength on temperature of operation. The heaviest loads were found at the output edges, where failure fractures consistently began. The time of thermal stress extremes was greater than the time of maximum temperature drop, and absolute values for temperature stress were basically proportional to the difference between maximum and minimum average temperature. Measurements during the cooling segment of the operational cycle showed that changes in the durability limits of the blade material simply changed the multiplier of the longevity dependence in relation to the magnitude of thermal stress at the output blade edge. The hypotheses generated were confirmed by statistical analysis. Author

N85-10116# Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF POWDER METALLURGY IN VARIOUS SECTIONS OF USSR c26
P. Koblikov *In its* USSR Rept.: Mater. Sci. and Met., No. 93 (JPRS-84810) 25 Nov. 1983 p 17-18 Transl. into ENGLISH from Sov. Molodezh (Riga), 16 Jul. 1983 p 2 (For primary document see N85-10110 01-23)
Avail: NTIS HC A04

The production of components made of powder has expanded considerably. The production of specialized equipment, means of automation, presses, roasting furnaces, and monitoring and testing equipment has also increased. In the current Five-Year Plan alone, great production capacities for producing iron powder were introduced in the plant in Brovary near Kiev, which is the largest in Europe, in a number of enterprises of the Dnepropetrovsk and Donetsk Oblasts, in the Krasnyy Sulin Plant of the Rostov Oblast, in the Tula Ferrous Metallurgical Association, and in Belorussia. Approximately 15 types of technological processes for producing products from powders of iron, copper, other metals and their alloys were developed and approved. They are used more often in the production of construction and electrotechnical products, hard alloy instruments and antifriction materials. Author

N85-10117# Joint Publications Research Service, Arlington, Va.
GRANULAR BOUNDARY SEGREGATION IN LOW-ALLOYED TITANIUM-VANADIUM ALLOYS Abstract Only c26
C. I. Kolodkina, I. I. Kryukova, A. I. Rybnikov, and S. S. Ushkov *In its* USSR Rept.: Mater. Sci. and Met., No. 93 (JPRS-84810) 25 Nov. 1983 p 30 Transl. into ENGLISH from Fiz. Metallov i Metallovedeniye (Sverdlovsk, USSR), v. 56, no. 1, Jul. 1983 p 160-164 (For primary document see N85-10110 01-23)
Avail: NTIS HC A04

Previous problems with brittleness of titanium-aluminum alloys were attributed to segregation of impurities such as nickel and iron on granular boundaries at high temperatures. The present study sought to test the hypothesis that this phenomenon is related to polymorphic conversion of the titanium. The test alloy contained up to 2.0% (by weight) vanadium. Formed into 15 mm diameter rods, it was annealed at various temperatures for 500 hours, then tested for brittleness. At nearly 500 C and 1 to 2% vanadium, brittleness was eliminated. After annealing at 850 C, impact strength declined markedly in comparison with that in the initial state and after processing at 700 and 900 C. Embrittlement was found where the solubility of vanadium in alpha-titanium was minimal, while 500 C embrittlement disappeared. Alloying and impurity elements were well distributed in all tested alloys. Particles found included iron alone, iron and vanadium, and iron, vanadium and nickel combinations. At higher temperatures, the bonds between metals were found to be unstable. The key factor in segregation was judged to be the energy suitability for a dissolved element in an alpha-solid solution. Author

N85-10118# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF ANNEALING ON PROPERTIES OF AT3 ALLOY WELDED JOINTS Abstract Only c26
G. M. Shelenkov, V. E. Troyanovskiy, V. Ye. Blashuk, L. M. Onopriyenko, G. Ye. Boyeva, and R. K. Melekhov *In its* USSR Rept.: Mater. Sci. and Met., No. 93 (JPRS-84810) 25 Nov. 1983 p 32 Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 6, Jun. 1983 p 53-55, 66 (For primary document see N85-10110 01-23)
Avail: NTIS HC A04

Residual stresses add with operating stresses and decrease the resistance of seams to delayed fracture. Heat treatment, decreasing residual stresses in welded joints of titanium alloys, decreases the total stress level and danger of cold cracking. The major structural material for the manufacture of hydrolytic apparatus operating in sulfuric acid is AT3 pseudo alpha alloy, alloyed with

aluminum and small quantities of beta stabilizing elements such as chromium, iron and silicon. To maintain good welded joint properties in hydrolytic apparatus, a technology of welding and heat treatment must be developed. The interaction of titanium with oxygen increases at 700 C and higher, hydrogenation beginning at 500 to 600 C and increasing with increasing temperature and humidity. The influence of annealing temperature in the 500 to 900 C temperature range on properties of AT3 alloy and its welded joints and determine heat treatment conditions providing optimal combinations of properties was established. Tests were performed on specimens made of hot rolled sheets of AT3 alloy 25 mm thick. Author

N85-10119# Joint Publications Research Service, Arlington, Va.
HEAT TREATMENT OF WELDED JOINTS IN OT4 AND VT20 TITANIUM ALLOYS Abstract Only **c26**
M. A. Khorev, Yu. V. Gusev, and N. K. Gribova *In its* USSR Rept.: Mater. Sci. and Met., No. 93 (JPRS-84810) 25 Nov. 1983 p 33 Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 7, Jul. 1983 p 19-23 (For primary document see N85-10110 01-23)
Avail: NTIS HC A04

The mechanical properties of welded joints in 3 mm thick specimens made by mechanized argon-arc welding without additive wire were studied. Heat treatment was performed in furnaces, in air with cooling in air, in water, and in a vacuum furnace. The change in mechanical properties upon quenching in water with subsequent aging was estimated. Heat treatment conditions are suggested to provide good ductility of joints with moderate strength or increased strength with moderate ductility. It is noted that it is possible to strengthen welded joints in OT4 alloy by hardening from 850 to 900 C and aging at 400 C, 4 hours, in VT20 alloy by hardening from 900 C and aging at 400 C, 4 hours. Hardening of welded joints in pseudo-alpha alloys by hardening and aging is, however, ineffective, since strength increases by only 10% to 18%, while ductility is reduced. Quenching of welded structures causes significant warping as well, producing great difficulties in industrial performance of the process. Author

N85-10120# Joint Publications Research Service, Arlington, Va.
STRENGTH OF WELDED JOINTS IN VT23 ALLOY UPON REPEATED STATIC LOADING Abstract Only **c26**
V. F. Topolskiy, S. I. Kishkina, L. A. Stronina, A. I. Khorev, Yu. D. Mikhalev, and V. Y. Leontyev *In its* USSR Rept.: Mater. Sci. and Met., No. 93 (JPRS-84810) 25 Nov. 1983 p 33-34 Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 7, Jul. 1983 p 42-44 (For primary document see N85-10110 01-23)
Avail: NTIS HC A04

Alloy VT23, 30 mm thick, was welded by two arcs using infusible tungsten electrodes in argon. Mechanical testing indicates that the SP14 and SP15 welding wires used in this study can provide a joint strength of 1000 to 1100 MPa. Short-term fatigue testing was performed with repeated pulsating load at 20 to 30 cycles per minute. The stress level of the test was 50% to 64% of the short-term strength of the material. The optimal heat treatment for these joints is annealing at 750 C in combination with two-stage aging. The SP15 wire yields the bent joint characteristics under these conditions. Author

N85-10121# Joint Publications Research Service, Arlington, Va.
FRACTURE TOUGHNESS CHARACTERISTICS OF WELDED JOINTS IN VT65 AND AT6 TITANIUM ALLOYS Abstract Only **c39**
S. I. Yesina, S. M. Kutepov, and V. N. Skorokhodov *In its* USSR Rept.: Mater. Sci. and Met., No. 93 (JPRS-84810) 25 Nov. 1983 p 34 Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 6, Jun. 1983 p 43-45 (For primary document see N85-10110 01-23)
Avail: NTIS HC A04

VT6S and AT6 high strength titanium alloys are used as corrosion resistant structural materials for the manufacture of high pressure vessels and other equipment. Increasing the strength of these alloys is accompanied by a decrease in their ductility. The problem of estimating the resistance of welded joints to brittle fracture is therefore an important one. The critical stress intensity factor for various sectors of the welded joint of hot rolled sheet AT6 and VT6S products 20 and 50 mm thick was determined. When 2V welded wire is used in manual argon arc welding, fracture toughness is equal to that of the base metal. AT6 rolled products are generally preferable to VT6S in terms of fracture toughness. Annealing in air at 820 C to 830 C for one hour was practically no influence on crack resistance of welded joints in the two metals. Author

N85-10122# Joint Publications Research Service, Arlington, Va.
FEATURES OF LASER WELDING OF MEDIUM CARBON STEEL THROUGH A CADMIUM COATING Abstract Only **c26**
A. A. Uglov and V. I. Ofer *In its* USSR Rept.: Mater. Sci. and Met., No. 93 (JPRS-84810) 25 Nov. 1983 p 35-36 Transl. into ENGLISH from Fiz. i Khim. Obrabotki Materialov (Moscow), no. 4, Jul. - Aug. 1983 p 17-21 (For primary document see N85-10110 01-23)
Avail: NTIS HC A04

The effect of cadmium as an easily melted coating on formation of melting zones during laser welding of steel 35 was determined on a Kvant-10 device with 4 ms impulse focussed on the material surface. Impulse energy was varied from 1 to 20 joules with a light filter. After welding, the metal structure was measured by etchin in HNO3, and microhardness was measured within 5%. The thermal effect zone was greatly increased with energy of 5 to 10 joules regardless of coating thickness. A series of tests was also run on laser welding of rings with a set clearance. Results show that the depth of the thermal effect zone remained the same as for welds with no clearance. Crater formation that occurred was attributed to the fact that cadmium vaporizes at a temperature half that of the melting temperature for steel 35. The cadmium served as an effective energy absorbent, bringing a reduced density to the required flow of laser energy. Author

N85-10123# Joint Publications Research Service, Arlington, Va.
SUPPRESSING POROSITY IN WELD JOINTS OF 1420 ALUMINUM ALLOY Abstract Only **c37**
M. A. Abralov, R. U. Abdurakhmanov, N. G. Kartyshov, A. A. Abdurakhimov, R. M. Saidov, M. A. Polezhayev, and F. R. Kulkov *In its* USSR Rept.: Mater. Sci. and Met., No. 93 (JPRS-84810) 25 Nov. 1983 p 36 Transl. into ENGLISH from Svarochnoye Proizv. (Moscow), no. 7, Jul. 1983 p 36-38 (For primary document see N85-10110 01-23)
Avail: NTIS HC A04

In melting welds of 1420 aluminum alloy the greatest problem is the tendency to form pores. A procedure is discussed that sought to minimize surface metal loss that results in processes involving mechanical scouring or chemical milling. A flux labelled TFA-8 was developed that contained fluorine compounds of calcium, barium, lithium and lanthanum, as well as lithium chloride and metallic nickel. The flux prevented reaction with the atmosphere that would produce hydrogen, created favorable conditions for surfacing and elimination of gas bubbles, lengthened the melt time of the weld seam, thus permitting gas bubbles to escape, and provided a microalloying effect that resulted in a denser seam metal structure. The resulting welded joints were found to have high corrosion resistance under conditions involving maritime mists and aqueous saline solutions in other applications. Author

N85-10124# Joint Publications Research Service, Arlington, Va.
EFFECT OF WELDING METHOD ON CORROSION RESISTANCE OF WELDED COMPOSITIONS MADE OF 1201 ALLOY Abstract Only **c37**
N. A. Pashina, L. Ye. Ivanova, and G. S. Ustinova *In its* USSR Rept.: Mater. Sci. and Met., No. 93 (JPRS-84810) 25 Nov. 1983 p 36-37 Transl. into ENGLISH from Svarochnoye Proizv. (Moscow), no. 7, Jul. 1983 p 34-35 (For primary document see N85-10110 01-23)
Avail: NTIS HC A04

The aluminum alloy 1201, in stressed and thermally-treated forms, is promising for products that are subjected to cold and

heat extremes. Argon arc and electron beam variants for welding joints, were subjected to artificial aging at 180 C after annealing. The resulting samples were measured for corrosion at seams, thermal effect zones, and in the basic metal, in solutions containing varying amounts of NaCl, H2O2, HCl and K2CrO4. Results show that the electron-beam welds provide better corrosion resistance as evidenced in part by their higher positive electrical potential.
Author

N85-10125# Joint Publications Research Service, Arlington, Va.
WELDABILITY OF AGED HEAT RESISTANT NICKEL ALLOYS Abstract Only c26
L. I. Sorokin *In its* USSR Rept.: Mater. Sci. and Met., No. 93 (JPRS-84810) 25 Nov. 1983 p 37-38 Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 7, Jul. 1983 p 12-16 (For primary document see N85-10110 01-23)
Avail: NTIS HC A04

It is suggested that the decrease in strength of welded joints in dispersion hardened alloys after aging is caused by a rise in the rate of increase of tensile deformations in the seam due to an increase in heat resistance of the alloys in the aged state, as well as the degree of strength loss in welded joints made after aging as a function of the composition of the metal, the welding wire and the welding method. Nickel alloys with high iron content were studied. Mechanical properties were determined in specimens cut across seams made in alloy samples 2, 12, 15 and 20 mm thick by argon-arc and electron beam welding. It was found that the alloys EP693, EP914 and EP718 when aged have 1/2 to 2/3 the resistance to hot crack formation that they have in the hardened state. Strength of EP437 alloy is the same in the hardened and aged states. Both methods of welding of all four alloys in the aged state using welding wire consisting of the base metal plus EP533 alloy produce joints with less heat resistance than that of joints aged after welding.
Author

N85-10126# Joint Publications Research Service, Arlington, Va.
NEW METALLURGICAL PROCESSES BASED ON HIGH-SPEED CRYSTALLIZATION AND DIFFUSION OF METALS c26
A. F. Belov *In its* USSR Rept.: Mater. Sci. and Met., No. 93 (JPRS-84810) 25 Nov. 1983 p 39-51 refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Metally (Moscow), no. 6, Nov. - Dec. 1982 p 11-20 (For primary document see N85-10110 01-23)
Avail: NTIS HC A04

The use of high speed crystallization processes for metals (VKM processes) and diffusion processes, including under hot isostatic compaction (GIP), opened up the possibility of creating new technological processes for producing high-quality metallic materials from nickel, titanium and aluminum alloys with a homogeneous structure and properties not previously achieved, including enhanced strength and failure toughness and short-time and long-time fatigue, higher high-temperature strength and corrosion resistance and a lower specific quantity of metal and labor intensiveness in fabrication of finished parts. Pellet metallurgy of heat resistant nickel and titanium alloys; aluminum alloys crystallized at cooling rates of 1,000 to 10,000 deg/s or at rates > or = 1,000,000 deg/s, and hot isostatic compaction to heal defects in metals are discussed as well as the efficiency of diffusion welding.
A.R.H.

N85-10127# Joint Publications Research Service, Arlington, Va.
EVALUATION OF THE ROLE OF DIFFUSION CREEP IN SUPERPLASTIC DEFORMATION Abstract Only c39
R. Z. Valiyev and V. I. Sergeyev *In its* USSR Rept.: Mater. Sci. and Met., No. 93 (JPRS-84810) 25 Nov. 1983 p 55-56 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Tsvetnaya Met. (Ordzhonikidze, USSR), no. 3, May - Jun. 1983 p 81-84 (For primary document see N85-10110 01-23)
Avail: NTIS HC A04

Deformation zones formed on a previously polished sample during the course of superplastic deformation were measured. Differing results of related earlier investigations prompted a comparison of variants of the method using the same MA-8 magnesium alloy (Mg+1.5%Mn+0.3% Ce), which is superplastic at a granule size of approximately 10 mkm and a temperature of 400 C. Results of regular and electron microscope examination indicate the redistribution of disperse particles leading to formation of separation-free zones near transverse granule boundaries, and increased longitudinal density of particles. Diffusion creep as well as granular boundary slippage and granule migration were judged to be involved in the restructuring process, which was more pronounced in surface layers than in deeper zones. The method of evaluating the role of diffusion creep in superplastic deformation by the breadth of surface deformation zones was found to be incorrect for the alloy tested.
Author

24 COMPOSITE MATERIALS

Includes laminates.

N85-10128# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
DESIGN SENSITIVITY ANALYSIS OF AN ANTISYMMETRIC ANGLE-PLY LAMINATE
S. Adali Jun. 1983 33 p refs
(CSIR-TWISK-318) Avail: NTIS HC A03/MF A01

Sensitivity of an optimally designed antisymmetric angle ply laminate to determine the effect of variations in the design variables on the performance of the structure was investigated. The laminate is optimized to minimize the maximum dynamic deflection and/or to maximize the eigenfrequency of a given mode. The design variables are the fiber orientations of the individual layers and the optimum point is determined by solving a nonlinear mathematical programming problem. In multipurpose problems the laminate is optimized for a given objective subject to a constraint, and the problems are solved by a penalty function technique. Global results on the sensitivities are obtained by solving a programming problem in a given sensitivity radius. The design problems in inequality constraints, are solved by performance contours. It is indicated that the sensitivity of a composite structure can be reduced by increasing the number of layers that compose the structure.E.A.K.

N85-10129*# National Aeronautics and Space Administration, Washington, D. C.
SINTERED SILICON NITRIDE WORKPIECE
N. Shinohara Aug. 1984 8 p Transl. into ENGLISH of Japanese Patent no. 58-64275, 16 Apr. 1983 p 379-381 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-77600; NAS 1.15:77600) Avail: NTIS HC A02/MF A01 CSCL 11D

A description is given of a sintering method for silicon nitride. A detailed explanation of the invention is presented. Four procedures for the sintering process are described.
Author

N85-10130*# National Aeronautics and Space Administration, Washington, D. C.
TREATING SILICON CARBIDE SINTER BY HEATING IN NITROGEN
S. Takahata Aug. 1984 10 p Transl. into ENGLISH of "Tanka keiso shohketsu tai no seizo hohhoh" Japanese Patent no. 58-64284, 16 Apr. 1983 p 423-426 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-77601; NAS 1.15:77601) Avail: NTIS HC A02/MF A01 CSCL 11D

A description is given of treating silicon carbide sinters by heating in nitrogen. A detailed explanation of the invention is presented. Two procedures to be followed in the invention are described.
Author

N85-10131*# National Aeronautics and Space Administration, Washington, D. C.
SILICON NITRIDE SINTERED BODY
K. Suzuki and N. Shinohara Aug. 1984 16 p Transl. into ENGLISH of Japanese Patent no. 58-91066, 30 May 1983 p 349-354 Transl.

by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-77602; NAS 1.15:77602) Avail: NTIS HC A02/MF A01 CSCL 11D

The sintering of silicon carbide and it production are described. The method of production is by calcination in which molding is followed by sintering without compression. The invention improves the composition of the silicon carbide ceramic. Six examples of the invention are illustrated and discussed. E.R.

N85-10132*# National Aeronautics and Space Administration, Washington, D. C.
SILICON NITRIDE POWDER
Masaaki Mori, Katsuyoshi Komeya, Akihiko Tsuge, and Hiroshi Inoue Oct. 1984 22 p refs Transl. into ENGLISH from Seramikkusu (Japan), v. 17, no. 10, 1982 p 834-840 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77731; NAS 1.15:77731) Avail: NTIS HC A02/MF A01 CSCL 11D

The characteristics and preparation methods of Si3N4 are reviewed. Special emphasis is placed on the correlation between impurities and strength of sintered Si3N4. B.W.

N85-10133# National Aerospace Lab., Tokyo (Japan).
THE THEORY OF ELASTIC MODULUS OF FABRIC COMPOSITES AND ITS EXAMINATION BY EXPERIMENTS
Takashi Ishikawa, Masamichi Matsushima, and Yoichi Hayashi 1984 20 p refs In JAPANESE; ENGLISH summary
(NAL-TR-808; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

Three analytical models for the investigation of the stiffness properties of woven fabric composites are presented. The mosaic model is effective for rough prediction of the elastic stiffness of fabric composites. The crimp model, which is particularly appropriate for plain weave composites, takes into account fiber continuity and undulation. The bridging model is developed to simulate the load transfer among the interlaced regions in satin weave composites. Comparison of theory and experiments is then conducted and leads to a good agreement for 8 harness satin carbon/epoxy composites. In the case of plain weave composites, there exists a great discrepancy between warping constrained and unconstrained predictions. Experimental results fall between these two theoretical curves. Clear dependency of elastic moduli on ply number is found for plain weave. A ratio of ply thickness to thread width is also a very important parameter by which elastic moduli of plain weave systems are strongly affected. In plane shear modulus of fabric composites is mainly determined by fiber volume fraction which is a function of ng. R.J.F.

N85-10134# California Univ., Los Angeles. School of Engineering and Applied Science.
THE EFFECTS OF RADIAL YARNS, 3-DIMENSIONALLY REINFORCED CARBON-CARBON COMPOSITE
D. Quan, G. Sines, and S. B. Batdorf 1 Jul. 1984 105 p
(Contract N00014-77-C-0505)
(AD-A144751; UCLA-ENG-84-22) Avail: NTIS HC A06/MF A01 CSCL 11/4

Some cylindrically wound, carbon-carbon billets have had gross fracture of the circumferential bundles during thermal processing. One function of the radial bundles is to reduce the stress that causes such fractures. An analysis is presented to show the potential reduction of the stress in the circumferential bundles during processing if the radial bundles remain intact. A simple analysis shows that the stress in the radial bundles is even higher than that in the circumferentials; therefore, they are likely to fail by either fracture or debonding. The radial bundles terminate at the outer and inner radii; an analysis is made of the debonding from the local shear near the ends of the radial bundles. Partial benefit of the radials might be obtained if creep reduced the stress in them. An experimental study on the creep of pitch-impregnated, uni-bundle specimens was conducted and results are presented. Based on creep of the radials, a procedure is presented to find an optimum time-temperature path to avoid failure of the radial bundles and characteristic optimum paths are presented. GRA

N85-10135# Drexel Univ., Philadelphia, Pa.
CUMULATIVE DAMAGE MODEL FOR ADVANCED COMPOSITE MATERIALS Final Report, Apr. 1982 - Aug. 1983
A. S. D. Wang, Pei Chi Chou (Dyna East Corp., Philadelphia, Pa.), Charles S. Lei, and Ronald B. Bucinell Wright-Patterson AFB, Ohio AFWAL 9 Mar. 1984 184 p
(Contract F33615-80-C-5039)
(AD-A144840; AFWAL-TR-84-4004) Avail: NTIS HC A09/MF A01 CSCL 11/4

This report presents the details of a methodology developed study in which cumulative damage in composite laminates is mathematically modeled. The basic concept adopted in the theoretical development is to regard the accumulation of damage in laminates as a load and/or time dependent process. The process begins with the initiation of sublaminate cracks at locations where dominating material flaws exist; under sustaining load, then, these cracks may grow and coalesce to form a large laminate crack, or cracked regions. Thus, the requirement of the model is to be able to describe the process and thereby relate the laminate strength, stiffness, and service life properties as a function of loading history. GRA

N85-10136# Department of Energy, Washington, D. C.
FLUORINATED DIAMOND PARTICLES BONDED IN A FILLED FLUOROCARBON RESIN MATRIX Patent Application
Gene W. Taylor and Herman E. Roybal, inventors (to DOE) Filed 14 Nov. 1983 11 p
(Contract W-7405-eng-36)
(DE84-014444; US-Patent-Appl-SN-551528) Avail: NTIS HC A02/MF A01

A method of producing fluorinated diamond particles bonded in a filled fluorocarbon resin matrix is discussed. Simple hot pressing techniques permit the formation of such matrices from which diamond impregnated grinding tools and other articles of manufacture can be produced. Teflon fluorocarbon resins filled with Al2O3 yield grinding tools with substantially improved work to wear ratios over grinding wheels known in the art. DOE

N85-10137# Department of Energy, Washington, D. C.
PREPARATION OF SILICON CARBIDE FIBERS Patent Application
George C. Wei, inventor (to DOE) Filed 12 Oct. 1983 5 p
(Contract DE-AC05-84OR-21400)
(DE84-014661; US-Patent-Appl-SN-541188) Avail: NTIS HC A02/MF A01

Silicon carbide fibers suitable for use in the fabrication of dense, high strength, high toughness SiC composites or as thermal insulating materials in oxidizing environments are fabricated by a new, simplified method wherein a mixture of short length rayon fibers and colloidal silica is homogenized in a water slurry. Water is removed from the mixture by drying in air at 120(0)C and the fibers are carbonized by heating the mixture to 800 to 1000(0)C in argon. The mixture is subsequently reacted at 1550 to 1900(0)C in argon to yield pure (BETA)-SiC fibers. DOE

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N85-10138*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ANALYSIS OF GLOW DISCHARGES FOR UNDERSTANDING THE PROCESS OF FILM FORMATION
M. Venugopalan (Univ. of Western Illinois, Macomb) and R. Avni

Washington Oct. 1984 127 p refs Submitted for publication (NASA-TM-83750; E-2231; NAS 1.15:83750) Avail: NTIS HC A07/MF A01 CSCL 07D

The physical and chemical processes which occur during the formation of different types of films in a variety of glow discharge plasmas are discussed. Emphasis is placed on plasma diagnostic experiments using spectroscopic methods, probe analysis, mass spectrometric sampling and magnetic resonance techniques which are well suited to investigate the neutral and ionized gas phase species as well as some aspects of plasma surface interactions. The results on metallic, semi-conducting and insulating films are reviewed in conjunction with proposed models and the problem encountered under film deposition conditions. It is concluded that the understanding of film deposition process requires additional experimental information on plasma surface interactions of free radicals and the synergetic effects where photon, electron and ion bombardment change the reactivity of the incident radical with the surface. Author

N85-10139 Department of the Air Force, Washington, D.C.
SYNTHESIS OF PENTAFLUOROTELLURIUM HYPOFLUORITE Patent
C. J. Schack, W. W. Wilson, and K. O. Christe, inventors (to Air Force) Issued 31 Jul. 1984 4 p Supersedes AD-D010219 (AD-D011212; US-Patent-4,462,975; US-Patent-Appl-SN-478581; US-Patent-Class-423-473) Avail: US Patent and Trademark Office CSCL 07/2

The present invention concerns itself with a method for synthesizing hypofluorite compounds by utilizing fluorine fluorosulfate as a fluorinating agent and to a novel pentafluorotellurium hypofluorite compound prepared thereby. Author (GRA)

N85-10140# Defence Research Information Centre, Orpington (England).
DEVELOPMENT AND APPLICATION OF FLUORINE-CONTAINING REAGENTS IN THE GAS CHROMATOGRAPHY OF CARBONYL COMPOUNDS
K. Kobayashi and S. Kawai Apr. 1984 14 p refs Transl. into ENGISH from Ann. Proc. Gifu Coll. Pharm. (Japan), v. 32, 1883 p 15-19
(BLL-DRIC-Trans-7205(3623.66)) Avail: NTIS HC A02/MF A01

Fluorine containing carbonyl reagents pentafluorophenylhydrazine (PFPH) and pentafluorobenzylhydroxylamine (PFBOA) have several advantages as gas chromatography (GC) condensing agents. The reagents PFPH and PFBOA are excellent derivatizing agents for water soluble carbonyl compounds, are easily extracted with organic solvents, and form derivatives that are extremely volatile. Condensation of PFPH with carbonyl compounds proceeds as readily in aqueous solution as in non-aqueous solvent. Determination of estrone and estradiol was performed. Derivitization of PFBOA with different steroids was undertaken. The reagent PFBOA is used in a method of analyzing urine and plasma for the antiviral durg arildone. The reagent PFBOA was also used for the determination of the antinuclear agent geranyl-geranyl acetone in human serum. A method for the microdetermination of biological components which sought to react the chosen component with a specific enzyme and determine the product by combination with analysis by PFBOA condensation. S.B.

N85-10141# National Inst. for Water Research, Pretoria (South Africa).
AN EVALUATION OF THE ELECTRODIALYSIS REVERSAL PROCESS (EDR) FOR THE DESALINATION OF BRACKISH WATER FROM THE OMARURU DELTA (SWA/NAMIBIA)
H. A. deVilliers, G. R. Botha, and P. F. Hamman (Department of Water Affairs, Namibia) 1983 14 p Presented at the Symp. on Desalination: New Develop. and Ind. Appl., Pretoria, 27 Oct. 1983
Avail: NTIS HC A02/MF A01

The upgrading of large quantities of high salinity water in South West Africa is discussed. The technical feasibility of the process is examined. The large amount of technical equipment needed is evaluated, and an economic assessment of the process based on a study of the estimated capital and operating cost of a full scale desalination plant is studied. E.R.

N85-10142# National Inst. for Water Research, Pretoria (South Africa).
OPERATING EXPERIENCES OF REVERSE OSMOSIS PLANTS TREATING RAND WATER BOARD (RWB) WATER: PITFALLS AND PROBLEMS
J-P. Leger 1983 26 p refs Presented at the Symp. on Desalination: New Develop. and Ind. Appl., Pretoria, 27 Oct. 1983
Avail: NTIS HC A03/MF A01

Results of a survey of the operating experience of reverse osmosis users treating RWB water are presented. Common problems and pitfalls are identified and solutions offered. A major cause of poor reverse osmosis performance is membrane fouling. Laboratory investigations into the nature of membrane fouling by Rand Water Broad (RWB) water are described. Author

N85-10143# National Aerospace Lab., Tokyo (Japan).
FURTHER DEVELOPMENTS OF A NONGRADIENT THEORY OF PREMIXED TURBULENT FLAMES
Goro Masuya (National Aerospace Lab., Kakuda, Japan) and Paul A. Libby (California Univ. at San Diego, La Jolla) Mar. 1984 12 p refs
(NAL-TR-802T; ISSN-0039-4010) Avail: NTIS HC A02/MF A01

Planar turbulent premixed flames employing the Bray-Moss model of thermochemistry and the Bray-Moss-Libby model of aerothermochemistry were analyzed. New mechanisms of countergradient diffusion and turbulence production were exposed by analyses. Analyses were based on a second-order closure, and used an empirical relation of the mean velocities and the fluctuation intensities of velocities within reactants and products among other closure hypotheses. The purpose is to replace that empirical relation with a conservation equation of a third-order correlation and thereby to place the theory on a firmer basis. The predictions of the present theory are very close to those of the former theory. Both calculations are encouraging agreement with the available experimental results. Author

N85-10144# Air Force Academy, Colo.
A POTENTIOMETRIC STUDY OF CHLOROALUMINATE EQUILIBRIA IN THE ALUMINUM CHLORIDE - 1-METHYL-3-ETHYLIMIDAZOLIUM CHLORIDE IONIC LIQUID Interim Report, 1 Jul. 1982 - 30 Jun. 1983
C. L. Hussey, T. B. Scheffler, J. S. Wilkes, and A. A. Fannin, Jr. Jun. 1984 26 p
(AD-A144729; FJSRL-TR-83-0007) Avail: NTIS HC A03/MF A01 CSCL 07/4

The upper limit on the stoichiometric equilibrium constant for the tetrachloroaluminate dissociation reaction, 2RAlCl4 yields RAl2Cl7 + RCl, was investigated in the room temperature ionic liquid aluminum chloride-1-methyl-3-ethylimidazolium chloride by means of a potentiometric titration procedure. A curve fitting procedure for locating the equivalence point in these titrations is also described. GRA

N85-10145# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Chemistry.
TWO SILICON PHTHALOCYANINES AND A SILICON NAPHTHALOCYANINE: SYNTHESIS, ELECTROCHEMISTRY AND ELECTROGENERATED CHEMILUMINESCENCE
B. L. Wheeler, G. Nagasubramanian, A. J. Bard, L. A. Schechtman, and D. R. Dininny 15 Aug. 1984 40 p
(Contract N00014-75-C-0693)
(AD-A144760; CWRU/DC/TR-14) Avail: NTIS HC A03/MF A01 CSCL 07/4

The synthesis, spectral characterization, and electrochemical behavior of bis(tri-n-hexylsiloxy)-2,3-phthalocyaninatosilicon (SiPc(OR)2), its dimer (RO(SiPcO)2R), and its naphthalocyanine analog (SiNc(OR)2) are described. All compounds show near UV absorption corresponding to Soret and N bands and intense absorption in the visible-near IR region corresponding to Q-bands. In CH2Cl2,

within the solvent stability limit, there are two reductions and one oxidation for SiPc(OR)2 and two reductions and two oxidations for RO(SiPcO)2R and SiNc(OR)2; all appear as reversible one electron waves, although n=2 for the dimer. The difference in the peak potentials of the first oxidation and first reduction waves agrees well with the excitation energy and fluorescence (corresponding to Q-bands) of SiPc(OR)2 and SiNc(OR)2. GRA

N85-10146# United Technologies Research Center, East Hartford, Conn.
INVESTIGATION OF THE CARS SPECTRUM OF CARBON MONOXIDE AT HIGH PRESSURE AND TEMPERATURE Final Report, Nov. 1981 - Feb. 1984
J. H. Stufflebeam, R. J. Hall, and A. C. Eckbreth Jul. 1984 67 p
(Contract F04611-82-C-0004)
(AD-A144816; UTRC/R83-956020-F; AFRPL-TR-84-042) Avail: NTIS HC A04/MF A01 CSCL 07/4

Spectroscopic investigations were conducted into the coherent anti-Stokes Raman spectroscopy (CARS) spectrum of CO. CARS is a remote laser diagnostic technique for temperature and species measurements in hostile combustion environments. As such it possesses considerable relevance to the Air Force in the general areas of ballistics and propulsion. This final report describes the results of investigations conducted into the effects of high pressure, specifically the phenomenon of collisional narrowing, on CARS spectra from which temperature and density information derive. Experimental studies of CARS spectra were conducted in carbon monoxide in a heated, high pressure cell over the range 300K-1500K, 1-100 atm. The spectra were used to evaluate the UTRC CARS computer code supplied to RPL for the calculation of CO CARS frequency distributions. GRA

N85-10147# Naval Postgraduate School, Monterey, Calif.
AN EXPERIMENTAL INVESTIGATION OF COMBUSTION PRESSURE OSCILLATIONS IN SOLID FUEL RAMJETS M.S. Thesis
T. M. Parafiorito Mar. 1984 48 p
(AD-A144870) Avail: NTIS HC A03/MF A01 CSCL 21/2

An experimental investigation of the mechanisms involved in combustion pressure oscillations in solid fuel ramjets was conducted. Dynamic pressure measurements of the combustion chamber and air inlet were recorded, while a series of tests using Plexiglas as a fuel were performed. Combustion chamber geometric changes were systematically made in order to help isolate the causal mechanisms. The air inlet system resonant frequency coupling with reattachment zone flow was found to be the major source of pressure oscillations while bypass air injection was the major source of disturbance to the upstream reattachment region of flow. The combustion efficiency of a vitiated air heater was also evaluated using a gas chromatograph to measure unburned fuel in the exhaust. Negligible unburned gaseous fuel existed for all fuel-air ratios and temperatures. Author (GRA)

N85-10148# Advanced Research and Applications Corp., Sunnyvale, Calif.
AN INVESTIGATION OF THE SOLUBILITY AND DIFFUSIVITY OF CHROMIUM IN GALLIUM ARSENIDE Special Interim Technical Report, 7 Feb. 1981 - 31 Jan. 1984
T. J. Magee, G. R. Woolhouse, D. A. Stevensen (Stanford Univ.), and M. Deal (Stanford Univ.) 23 May 1984 260 p
(Contract N00014-80-C-0482)
(AD-A144949) Avail: NTIS HC A12/MF A01 CSCL 07/4

Phase equilibria in the Ga-As-Cr system have been studied and determined between room temperature and 1300 C by differential thermal analysis and x-ray diffraction. Solubility studies of Cr in GaAs have also been performed together with three types of diffusion experiments: indiffusion, outdiffusion and junction diffusion. Cr concentration-depth profiles determined by SIMS have been fitted to a diffusion model. Some of the anomalous behavior of Cr in GaAs observed here and in other studies have been explained in terms of the phase equilibria information and the solubility and diffusion results. Author (GRA)

N85-10149# Rocketdyne, Canoga Park, Calif.
HMX COMBUSTION MODIFICATION Final Report, 1 Mar. 1981 - 29 Feb. 1984
J. E. Flanagan, M. B. Frankel, and D. O. Woolery Aug. 1984 92 p
(Contract F49626-81-C-0031)
(AD-A145071; RI/RD84-144; AFRPL-TR-84-044) Avail: NTIS HC A05/MF A01 CSCL 21/2

Studies were conducted during this 3-year program to better understand the HMX decomposition mechanism by focusing upon the later stages of the multistep, complex decomposition process utilizing both isotopically labeled (N to the 15th power) and unlabeled HMX under low (approximately 300 C) and high (approximately 600 C) temperatures and at high heating rates. A novel experimental technique was developed, which utilized mass spectrometry and gas chromatography to identify quantitatively the amounts of gaseous species generated on pyrolysis of the substrates. This permitted detection of any chemical and/or thermal interactions between various energetic materials and an understanding of those interactions that contributed or deterred the burn rate of HMX or RDX. Compounds that yielded NH3, were oxygen free, and decomposed exothermically, had a significant effect upon the decomposition of HMX via an exothermic gas-phase reduction of NO (a decomposition product of HMX). This effect was caused by the formation of amidogen (NH2) radicals from the generated NH3. Pyrolysis studies performed on various azide compounds showed that the azide moiety increased the burn rate of HMX. Close matching of the decomposition temperatures of HMX and the additive was required to enhance the chemical and/or thermal interactions between the gaseous decomposition products. Attempts to incorporate the azide group into the HMX structure were successful. Its incorporation in propellants containing HMX did not result in an enhanced burn rate. GRA

N85-10150# State Univ. of New York, Buffalo. Buffalo Dept. of Chemistry.
SPECTROPHOTOMETRIC STUDIES OF IODINE COMPLEXES IN AN ALUMINUM CHLORIDE - BUTYLPYRIDINIUM CHLORIDE IONIC LIQUID
Z. J. Karpinski and R. A. Osteryoung Jul. 1984 33 p
(Contract N00014-79-C-0682)
(AD-A145074; SUNYBUF/DC/TR-20) Avail: NTIS HC A03/MF A01 CSCL 20/6

Iodine, iodine chloride, tetraethylammonium iodide and tetraethylammonium triiodide solutions in aluminum chloride -N-(1-butyl) pyridinium chloride ambient temperature ionic liquids have been studied by u.v. - visible spectrophotometry. The different oxidation states of iodine show a distinct dependence on the solvent acidity. Iodine(+1) exists in the form of ICl in acidic melts and in the form of ICl2I- in basic AlCl3-BuPyCl mixtures. Molecular iodine does not form strong complexes in acidic or neutral solutions. GRA

N85-10151# Department of Energy, Washington, D. C.
METHOD AND APPARATUS FOR DETERMINING PRESSURE-INDUCED FREQUENCY-SHIFTS IN SHOCK-COMPRESSED MATERIALS Patent Application
David S. Moore and Stephen C. Schmidt, inventors (to DOE) Filed 16 Dec. 1983 18 p
(Contract W-7405-eng-36)
(DE84-014313; US-Patent-Appl-SN-562150) Avail: NTIS HC A02/MF A01

A method and an apparatus for conducting coherent anti-Stokes Raman scattering spectroscopy in shock compressed materials are disclosed. The apparatus includes a sample vessel having an optically transparent wall and an opposing optically reflective wall. Two coherent laser beams, a pump beam and a broadband Stokes beam, are directed through the window and focused on a portion of the sample. In the preferred embodiment, a projectile is fired from a high pressure gas gun to impact the outside of the reflective wall, generating a planar shock wave which travels through the sample toward the window. The pump and Stokes beams result in the emission from the shock compressed sample

of a coherent anti-Stokes beam, which is emitted toward the approaching reflective wall of the vessel and reflected back through the window. The anti-Stokes beam is folded into a spectrometer for frequency analysis. The results of such analysis are useful for determining chemical and physical phenomena which occur during the shock compression of the sample. DOE

N85-10152# Pacific Northwest Lab., Richland, Wash.
THERMODYNAMIC PROPERTIES AND ENVIRONMENTAL CHEMISTRY OF CHROMIUM
R. L. Schmidt Jul. 1984 57 p refs
(Contract DE-AC06-76RL-01830)
(DE84-015123; PNL-4881) Avail: NTIS HC A04/MF A01

Values of standard entropy, standard enthalpy of formation, and standard free energy of formation for Cr and its solid and aqueous species are tabulated. These values were selected or recalculated after evaluation of the best available current thermochemical data. The basis for selection of data centered on conformation with recent studies for Cr(3+) and CrO4(2-). It is planned that the thermodynamic data presented go into the data base of the geochemical computer model, MINTEQ. The distribution of Cr in the environment among its aqueous inorganic species is, according to the thermodynamic data, highly dependent upon pH and Eh and the presence of complexing ligands. The speciation of Cr in natural waters is also controlled by reduction and complexation by organic matter, adsorption, and oxidation by Mn-oxide in suspended particulate matter and sediment, and reduction by H2S released from anoxic sediments. DOE

N85-10153# Deutsches Elektronen-Synchrotron, Hamburg (West Germany).
THE X-RAY ABSORPTION COEFFICIENT FINE STRUCTURE (EXAFS) STUDY ON PRECIPITATES IN AlCu
B. Lengeler (Kernforschungsanlage, Juelich, West Germany) and P. M. Eisenberger (Exxon Research and Engineering Co., Linden, New York) Apr. 1984 8 p refs Submitted for publication
(DESY-SR-84-15; ISSN-0723-7979) Avail: NTIS HC A02/MF A01

The supersaturated solid solution (SSSS) and Guinier-Preston I (GPI) zones of AlCu alloy quenched from 450 C to room temperature were investigated by X-ray spectroscopy. Results show that to prevent the decomposition of the SSSS it is necessary to quench the alloy to temperatures below minus 30 deg C. In the dilute limit the lattice distortion of the first Al coordination shell around a Cu atom is -(0.005 + or - 0.001) nm. The fraction of Cu precipitating into GPI zones depends on the initial Cu concentration and on the aging temperature. The GPI zones in AlCu are monolayers of pure Cu with Cu occupying Al sites. The shrinkage of the neighboring Al planes towards the Cu platelets is 16 %. The AlCu alloys with GPI zones which are reverted at 200 deg C resemble an SSSS only within the first 100 sec. After 1 hr at 200 deg C a state different from an SSSS is reached.
Author (ESA)

N85-10154# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
COMPRESSIBILITY AND FUGACITY OF GASEOUS HYDROGEN
H. P. vanLeeuwen 18 Aug. 1983 35 p refs
(NLR-TR-83079-U) Avail: NTIS HC A03/MF A01

The concept of fugacity is explained. Application of compressibility and fugacity data in hydrogen embrittlement calculations is discussed. Equations of state are reviewed. Compressibility factors and fugacity coefficients are calculated. A best estimate is proposed. Author (ESA)

N85-10155# Texas A&M Univ., College Station. Dept. of Chemistry.
AN ELECTROCHEMICAL APPROACH TO THE PREVENTION OF BIOFOULING PHENOMENA Final Report
J. O. Bockris, H. P. Dhar, and L. R. Langham Aug. 1983 44 p refs
(Contract DI-140340999109446)
(PB84-202613; OWRT-C-00114-S(0446)(1)) Avail: NTIS HC A03/MF A01 CSCL 07D

An electrochemical anti-biofouling method was developed. The method is based on the bactericidal action of H2O2 generated in situ on the electrode surface from the dissolved oxygen present in the electrolyte. It was tested in 3% saline solution and in sea water using bacteria Vibrio Anguillarum, Pseudomona atlantica, Pseudomona stutzeri and Aeromonas hydrophilia. GRA

N85-10156# National Academy of Sciences - National Research Council, Washington, D. C. Solid State Sciences Committee.
SYNTHESIS AND CHARACTERIZATION OF ADVANCED MATERIALS Final Report, 1978 - 1984
1984 118 p Sponsored in part by NSF
(Contract DE-FG01-81ER-10844; Grant NSF DMR-81-19500)
(PB84-215326) Avail: NTIS HC A06/MF A01 CSCL 07D

The SACAM report is based on a workshop held on December 11-13, 1978. The report assesses the status and future directions of SACAM from the perspective of solid state chemists and of other scientists who interact closely with solid state scientists. It addresses the scientific and technological accomplishments of SACAM, the societal needs and future opportunities that SACAM will face, and human and material resource needs for effective synthesis and characterization of advanced materials. GRA

N85-10157# Oklahoma Univ., Norman. School of Chemical Engineering and Materials Science.
EQUATION OF STATE STUDY FOR POLAR FLUIDS Annual Report, Nov. 1982 - Nov. 1983
K. E. Starling, L. L. Lee, T. H. Chung, and M. H. Li Nov. 1983 163 p
(PB84-222601; GRI-84-0004; AR-3) Avail: NTIS HC A08/MF A01 CSCL 07D

Two major studies have been performed during this project year. The continuation of our research on the statistical mechanical local composition theory is discussed. The development of a composition-dependent equation of state for the prediction of vapor-liquid equilibria employing the local composition model is also discussed. Statistical mechanical calculations using the Percus-Yevick equation of state have been employed for the Kihara potential model for the argonnitrogen mixture to obtain information about the variations of the local compositions with composition, temperature, and density. Based on the results of these calculations, the authors have analyzed the theoretical foundations of the expressions for the excess free energy. The application of the local composition model to the new generalized equation of state has been examined for VLE predictions of selected mixtures. The LCM improves VLE predictions for strongly nonideal systems for which conventional mixing rules have been unsatisfactory.
GRA

N85-10158# Los Alamos Scientific Lab., N. Mex.
COMPILATION OF ELEMENTAL CONCENTRATION DATA FOR NBS (NATIONAL BUREAU OF STANDARDS) BIOLOGICAL, GEOLOGICAL AND ENVIRONMENTAL STANDARD REFERENCE MATERIALS, 1982 Final Report
E. S. Gladney, C. E. Burns, D. R. Perrin, I. Roelandts (Liege Univ.), and T. E. Gills (NBS) Mar. 1984 235 p refs
(PB84-218338; NBS/SP-260/88; LC-84-601009) Avail: NTIS HC A11/MF A01; also available SOD CSCL 07D

Concentration data on 88 constituents in 75 NBS Standard Reference Materials have been collected from over 850 journal articles and technical reports. These data are summarized into mean values with uncertainties expressed as +/- one standard deviation and compared with available certification data from NBS. Data are presented on the analytical procedures employed and all raw data are given in the appendices. GRA

N85-10159# National Bureau of Standards, Washington, D.C. Center for Chemical Engineering.
A THERMODYNAMIC SURFACE FOR THE CRITICAL REGION OF ETHYLENE Final Report
J. M. H. Levelt Sengers, G. A. Olchowy (Maryland Univ.), B.

Kamgar-Parsi (Maryland Univ.), and J. V. Sengers May 1984 100 p refs
(PB84-217850; NBS/TN-1189) Avail: NTIS HC A05/MF A01; also available SOD CSCL 07D

Tables are presented of thermodynamic properties of ethylene in the range 279-300K in temperature, 5.75 - 10.5 mol/cu dm in density, which range includes the critical point. The tables are based on the critical-point scaling laws and incorporate the critical anomalies are presently known from renormalization group theory. The predictions of the present formulation are compared with four sets of recent PVT data, and with speed of sound and enthalpy data. Tables are presented of pressure, energy, enthalpy, entropy, specific heats and speed of sound as function of temperature along finely spaced isochores. The computer program required for table generation is included. GRA

N85-10160# Romicon, Inc., Woburn, Mass.
EVALUATION OF HOLLOW FIBER ULTRAFILTRATION AS A PRETREATMENT FOR REVERSE OSMOSIS DESALINATON OF SEAWATER Technical Completion Report, 1 Apr. 1979 - 30 Sep. 1980
Barry R. Breslau, Anthony J. Testa, and Brian M. Kilcullen 1984 176 p
(Contract DI-14-34-0001-8558)
(PB84-212406; OWRT-C-80309-S(8558)(1)) Avail: NTIS HC A09/MF A01 CSCL 07A

An intensive study was conducted at the Wrightsville Beach Test Facility to evaluate the performance of hollow fiber ultrafiltration membranes as a pretreatment for seawater desalination via reverse osmosis. Several polymer types were evaluated to determine the best ultrafiltration membrane. In addition, two different fiber diameters (20 and 43 mil) were studied to investigate the effects of flow through the hollow fiber cartridge on flux, cleaning, and membrane life. The results from these tests show that the polysulfone PM-50 membrane (50,000 M.W. cutoff) which has a 43 mil internal diameter is well suited for seawater pretreatment. Various cleaning chemcials (sodium hydroxide, sodium hypochlorite, citric acid, surfactant types, etc.) were evaluated in several combinations of operating modes (reverse flow, backflush) to optimize the membrane performance. GRA

N85-10161# National Bureau of Standards, Washington, D.C. Center for Chemical Engineering.
INTERPOLATION FORMULAS FOR VISCOSITY OF SIX GASES: AIR, NITROGEN, CARBON DIOXIDE, HELIUM, ARGON AND OXYGEN Final Report
Frank E. Jones Feb. 1984 30 p refs
(PB84-217801; NBS/TN-1186) Avail: NTIS HC A03/MF A01; also available SOD CSCL 07D

Equations for the calculation of viscosity for dry air, nitrogen, carbon dioxide, helium, argon, and oxygen developd as interpolation formulas fitted to experimental data. The approximate ranges of strict application of the equations are the ranges of temperature between 20C and 50C and pressure from 0.04 to 4 MPa; for the experimental data. The estimates of relative residual standard deviation for the fits (0.05% for air, 0.03% for nitrogen, 0.02% for carbon dioxide, 0.02% for helium, 0.03% for argon, and 0.03% for oxygen) are in close agreement with estimates of precision for the experimental data. GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N85-10162 United Kingdom Atomic Energy Authority, Risley (England).
DELAYED FRACTURE OF HIGH-STRENGTH STEELS IN SPHERICAL TANKS FOR LP GAS
N. Ogura [1983] 28 p refs Transl. into ENGLISH from Koatsu Gasu (Japan), v. 13, no. 11, 1976 p 17-24
(BLL-Risley-TR-4926(9091.9F)) Copyright. Avail: Issuing Activity

Accidents involving the brittle fracture of spherical tanks that occurred during water pressure tests in 1968 in the Yamaguchi Prefecture and then a week later in the Chiba Prefecture attracted considerable interest among those concerned not only with the type of tank but also with steel structural materials. As a result of subsequent research it was established that these brittle fracture accidents were closely related to the phenomenon of delayed fracture. In addition, the complex problem of crack formation as a result of the influence of hydrogen sulphide in spherical tanks has been examined and this has been described as a phenomenon involving delayed crack formation as a result of the influence of the environment. Brittle fracture accidents must be prevented at all costs particularly during usage of various types of storage tanks, not to mention during usage of spherical tanks. Although many countermeasures are required to achieve this, measures to prevent delayed fracture must not be forgotten. Author

N85-10163*# Purdue Univ., Lafayette, Ind. Lab. for Electroceramics.
MOD SILVER METALLIZATION FOR PHOTOVOLTAICS Quarterly Technical Report, 1 Mar. - 31 May 1984
G. M. Vest and R. W. Vest 16 Jul. 1984 41 p Sponsored in part by DOE Prepared for JPL
(Contracts NAS7-100; JPL-956679)
(NASA-CR-174011; DOE/JPL-956679-84/2; NAS 1.26:174011; DRD-207; DRL-SE-2) Avail: NTIS HC A03/MF A01 CSCL 11F

It was demonstrated that the nature of the initial solvent used to extract the silver neodecanoate during synthesis or to render it into solution for ink formulation has a profound influence on fired film properties. The lower the boiling point of the initial solvent, the more of it was removed during rotary vacuum evaporation, and the less effect it had on fired film properties. Benzene and tetrahydrofuran were superior to xylene and toluene, and inks which used them in their preparation produced fired films with excellent appearance and adhesion if the proper firing sequence was used. The best films also had electrical resistivities very close to that of pure silver, which indicates that near theoretical density was achieved. Platinum and palladium metallo-organic compounds were investigated so that fired films with good solder leach resistance could be produced. Six metallo-organic compounds were synthesized, four of them were used to make inks, and the properties of films made from these inks were evaluated. The most promising compound evaluated was Pt 2,4 pentane dionate, but additional studies are required. DOE

N85-10164*# University of Eastern Kentucky, Richmond. Dept. of Physics and Astronomy.
STUDY OF PROTON AND NEUTRON ACTIVATION OF METAL SAMPLES IN LOW EARTH ORBIT Quarterly Technical Report
C. E. Laird 26 Oct. 1984 5 p
(Contract NAS8-35180)
(NASA-CR-171183; NAS 1.26:171183) Avail: NTIS HC A02/MF A01 CSCL 11F

The analysis of the gamma-ray spectra taken from samples flown in Spacelab 1; the search for and review of neutron and proton activation cross-sections needed to analyze the results of the Long Duration Exposure Facility (LDEF) activation measurements; additional calculations of neutron induced activation for the LDEF samples; the data analysis plan for the LDEF and Spacelab 2 samples; the measurement of relevant cross-sections with activation of samples of V, Co, In, and Ta at the Indiana University Cyclotron Facility; and the preparation of an extended gamma-ray calibration source through the development of a proper technique to accurately deposit equal quantities of radioactive material onto a large number of point on the source are discussed. R.J.F.

N85-10165*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MORPHOLOGICAL CHANGES OF GAMMA PRIME PRECIPITATES IN NICKEL-BASE SUPERALLOY SINGLE CRYSTALS Ph.D. Thesis - Case Western Reserve Univ., May 1984

Rebecca A. MacKay Jul. 1984 232 p refs
(Grant NsG-3246)
(NASA-TM-83698; E-2156; NAS 1.15:83698) Avail: NTIS HC A11/MF A01 CSCL 11F

Changes in the morphology of the gamma prime precipitate were examined during tensile creep at temperatures between 927 and 1038 C in [001]-oriented single crystals of a Ni-Al-Mo-Ta superalloy. In this alloy, which has a large negative misfit of -0.80%, the gamma prime particles link together during creep to form platelets, or rafts, which are aligned with their broad faces perpendicular to the applied tensile axis. The dimensions of the gamma and gamma prime phases were measured as directional coarsening developed in an attempt to trace the changing morphology under various stress levels. In addition, the effects of initial microstructure, as well as slight compositional variations, were related to raft development and creep properties. The results showed that directional coarsening of gamma prime began during primary creep, and under certain conditions, continued to develop after the onset of steady-state creep. The length of the rafts increased linearly with time up to a plateau region. The thickness of the rafts, however, remained equal to the initial gamma prime size at least up through the onset of tertiary creep; this is a clear indication of the stability of the finely-spaced gamma-gamma prime lamellar structure. It was found that the single crystals with the finest gamma prime size exhibited the longest creep lives, because the resultant rafted structure had a larger number of gamma-gamma prime interfaces per unit volume of material. R.J.F.

N85-10166*# Purdue Univ., Lafayette, Ind.
EFFECTS OF COBALT, BORON, AND ZIRCONIUM ON THE MICROSTRUCTURE OF UDIMET 738 M.S. Thesis. Final Report
Todd G. Nakanishi Sep. 1984 76 p refs
(Grant NAG3-59)
(NASA-CR-174762; NAS 1.26:174762) Avail: NTIS HC A05/MF A01 CSCL 11F

A structural study was carried out on Co modified Udimet 738 alloys containing 0.04, 0.10, and 0.20 wt % Zr at 0.01 and 0.03 wt % B levels. Samples in the as-cast and solution-treated conditions were exposed at 843 C to study structural stability. The structures produced by the interactions of Co, Zr, and B were studied by SEM, X-ray diffraction, and dispersive analysis techniques. The additions of large amounts of Zr and B were found to increase the solidification range of the U-738. Structural changes involved eutectic gamma prime islands, formation of low melting point compounds, and precipitation of borides and Zr rich phases. Boron and zirconium additions did not show substantial changes in mechanical properties. Removal of Co from the alloys resulted in reduction of the matrix solubility for carbon and increase in the gamma prime solvus. Structural instabilities found were continuous grain boundary M23C6 films, MC breakdown, and plate-like phases. Removal of cobalt resulted in a slight decrease in tensile and stress rupture properties. Detailed structural results presented. R.S.F.

N85-10167*# National Aeronautics and Space Administration, Washington, D. C.
POWDER CONTAINING 2H-TYPE SILICON CARBIDE PRODUCED BY REACTING SILICON DIOXIDE AND CARBON POWDER IN NITROGEN ATMOSPHERE IN THE PRESENCE OF ALUMINUM
Nobuyuki Kuramoto and Hitofumi Takiguchi Aug. 1984 15 p Transl. into ENGLISH of Japanese Patent No. 58-49611 (Patent Application No. 56-144758, 16 Sep. 1981), 23 Mar. 1983 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77597; NAS 1.15:77597) Avail: NTIS HC A02/MF A01 CSCL 11F

The production of powder which contains silicon carbide consisting of 40% of 2H-type silicon carbide, beta type silicon carbide and less than 3% of nitrogen is discussed. The reaction temperature to produce the powder containing 40% of 2H-type silicon carbide is set at above 1550 degrees C in an atmosphere of aluminum or aluminum compounds and nitrogen gas or an antioxidation atmosphere containing nitrogen gas. The mixture ratio of silicon dioxide and carbon powder is 0.55 - 1:2.0 and the contents of aluminum or aluminum compounds within silicon dioxide is less than 3% in weight. Author

N85-10168*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE EFFECTS OF SEVEN ALLOYING ELEMENTS ON THE MICROSTRUCTURE AND STRESS-RUPTURE BEHAVIOR OF NICKLE-BASE SUPERALLOYS
D. R. Hull, R. V. Miner, and C. A. Barrett Oct. 1984 28 p refs
(NASA-TM-83791; E-2287; NAS 1.15:83791) Avail: NTIS HC A03/MF A01 CSCL 11F

Seven alloying elements: Al, Cr, Ti, Nb, Ta, Mo, and W were added at two levels of concentration to produce a series of experimental nickel-base superalloys. Fifty alloys, representing a fraction of a 2 to the 7th power factorial design, were cast, tested, and analyzed. Each alloy's microstructure was characterized by phase extractions, X-ray diffraction, metallography and energy dispersive X-ray spectroscopy. Regression analysis was used to determine the effect of alloying element content on microstructure and stress-rupture life. Author

N85-10169# Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
REAL TIME SENSING AND CONTROL OF OUT-OF-PLANE DISTORTION DUE TO LINE HEATING BY LASER M.S. Thesis
R. C. Johnson Jun. 1984 110 p
(Contract N66314-70-A-0073)
(AD-A144773) Avail: NTIS HC A06/MF A01 CSCL 11/6

Experiments were conducted using a U.T.C. 15 kw CO2 laser. The laser was used as a heat source to perform line heating on HY-80 and AISI 1018 specimens. The resulting angular distortion, as a function of heat input, speed, and number of passes, was measured. This out-of-plane distortion is measured using an interferometer which uses a 5 mw helium-neon laser as a light source. As the interference fringes appear on the specimen surface, they are recorded by a video camera and stored on a video cassette recorder to provide real time distortion information. HY-80 averaged 0.8 per pass while AISI 1018 averaged 1.1 per pass. Strain and temperature data were taken to be used as baseline data. The results are presented in the form of temperature and strain plotted against time. A heat transfer/temperature analysis was performed using ADINAT; results of experimental and analytical temperatures are plotted for comparison. Author (GRA)

N85-10170# Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Enginering.
RESEARCH ON HIGH-STRENGTH STEELS WITH AN IMPROVED RESISTANCE AGAINST WELD CRACKING M.S. Thesis
F. F. Hillenbrand, III . Jun. 1984 149 p
(Contract N66314-70-A-0073)
(AD-A144830) Avail: NTIS HC A07/MF A01 CSCL 13/8

Current American practices are surveyed to determine which weld cracking tests are used, and what methods are used to prevent and control weld cracking. The cracking resistance of a newly developed quenched and tempered High Strength Low Alloy (HSLA) steel. K-TEN8OCF, is researched. Using the Tekken self-restraint weld cracking test and Gas Metal Arc (GMA) welding, the new steel is compared against two commonly used high strength steels at various preheat levels. An investigation is made into the possible impacts of the cracking test results, based particularly upon the survey of practices. The steel test plates were subjected to X-ray, dye penetrant, and macroscopic and microscopic examinations to determine the extent of any existent cracking. It was found that the HBLA steel exhibited an excellent resistance to cracking, even when welded without the use of preheat; whereas, the T-1 and HY-80 steels had to be preheated in order to ensure cracking did not occur. GRA

N85-10171# United Technologies Research Center, East Hartford, Conn.

NONLINEAR ULTRASONIC CHARACTERIZATION OF OXYGEN IMPURITIES IN TITANIUM, 2 Final Report
H. I. Ringermacher and R. S. Williams Sep. 1983 24 p
(Contract N00014-82-C-2346)
(AD-A144857; AD-E001645; UTRC-R83-996217) Avail: NTIS HC A02/MF A01 CSCL 11/6

Titanium specimens containing oxygen impurities ranging from 0.1 to 0.3 percent by weight have been examined using nonlinear ultrasonic techniques. The amplitude of the second harmonic ultrasonic response has been observed to deviate from the expected perfect square law behavior. The increasing deviation correlates well with increasing oxygen contamination. Measurements of third harmonic generation showed no significant correlation with oxygen content. Following a brief review of the important results and an introductory section, the theory, experimental techniques and test results are presented in detail. GRA

N85-10172# Naval Ship Research and Development Center, Bethesda, Md.
IMPLANTATION OF IONIZED MONOMER INTO ALUMINUM ALLOY 6061 FOR MARINE CORROSION PROTECTION
S. R. Taylor, G. L. Cahen, Jr., G. E. Stoner, P. J. Moran, and M. W. Ferrulli Jul. 1984 57 p
(S01-54)
(AD-A144874; DTNSRDC-84/046) Avail: NTIS HC A04/MF A01 CSCL 13/8

Ion implantation technology has been extended to include the ionization of monomer gases and their subsequent acceleration and implantation into metallic and other substrates. The variables and options involved in the process are numerous and are discussed in the report. The resulting thin films are polymeric in nature and possess no traditional interface with the substrate, thus improving adhesion. The purpose of this study is to investigate these ion-beam-related film formation techniques for their ability to protect 6061-T6 aluminum alloy from corrosion attack in natural seawater. Improved resistance to pitting corrosion was observed for several of the treatments tested. The best resistance to pitting was produced by the following treatment: a 30-keV hydrogen ion beam is directed through a butadiene collisional gas with a 13.6-V/cm field applied to the substrate. This treatment is believed to promote hydrocarbon polymerization, resulting in a thin film possessing increased adhesion and film integrity. It should be re-emphasized that the purpose of this investigation was to screen a number of possible treatments for protection of one alloy in seawater. The positive results will hopefully encourage broader experimentation with this unique and potentially very useful technology. Author (GRA)

N85-10173# North Carolina Univ., Chapel Hill.
TRANSITION METAL CARBENE COMPLEXES Final Technical Report, 15 Nov. 1978 - 15 May 1984
G. R. Husk, M. Brookhart, and W. E. Studabaker 14 Jul. 1984 6 p
(Contract DAAG29-79-D-1002; Grant DAAG29-79-G-0025)
(AD-A144879; ARO-16391.3-CH; ARO-21043.4-CH) Avail: NTIS HC A02/MF A01 CSCL 07/3

Aryidene complexes of ruthenium have been successfully prepared. These complexes possess reasonable stability and undergo cyclopropanation reactions with olefins. Cis-stereochemistry predominates in the latter reactions. A remarkably stable cyclopropyl substituted carbene complex of iron has been prepared. This complex also undergoes cyclopropanation reactions. Author (GRA)

N85-10174# SumX Corp., Austin, Tex.
INHIBITION OF HYDROGEN ABSORPTION DURING PLATING OF HIGH STRENGTH STEELS Final Report
D. W. DeBerry, J. S. Payne, and J. Brunson Jul. 1984 36 p
(Contract N62269-83-M-3349)
(AD-A144882; NADC-84102-60) Avail: NTIS HC A03/MF A01 CSCL 13/8

Hydrogen absorbed by steel parts during the cadmium plating process can cause cracking failures in service. This feasibility study was concerned with the effects of precoating steel with an electroactive coating on the amount of hydrogen absorbed during subsequent cadmium plating. Redox couples having rather negative standard redox potentials were successfully immobilized on steel surfaces. However, these coatings either had no effects or increased the amount of hydrogen absorbed during the cadmium plating step. Possible reasons for this behavior are given in this report along with other pertinent experimental findings. Alternate approaches to solving the hydrogen absorption problem are discussed. Author (GRA)

N85-10175# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A STUDY OF VACUUM MELTING TO INCREASE THE TOUGHNESS OF MARAGING STEELS
H. Yaowen and P. Yucheng 27 Jul. 1984 21 p Transl. into ENGLISH from Kexue Jishu (China), v. 3, no. 6, 1983 p 418-425
(AD-A145017; FTD-ID(RS)T-0840-84) Avail: NTIS HC A02/MF A01 CSCL 11/6

Some factors which influence the toughness and strength of maraging steels are examined including microimpurities, inclusions, and melting techniques. In addition, the ability of vacuum injection melting, vacuum arc remelting, and electron beam refining to eliminate impurities in maragin steels is discussed. M.G.

N85-10176# Paris VI Univ. (France).
RELATIONSHIPS BETWEEN ELECTRONIC STRUCTURE AND STABILITY OF METALLIC GLASSES Final Scientific Report, 30 Sep. 1978 - 31 Dec. 1982
F. Abeles, M. L. Theye, and V. N. Van May 1984 45 p
(Grant AF-AFOSR-3701-78)
(AD-A145141; AFOSR-84-0706TR) Avail: NTIS HC A03/MF A01 CSCL 11/6

Amorphous Au-Ge and Ag-Ge alloy films were prepared by co-evaporation on low-temperature (15-20K) substrates under ultra-high vacuum for Ge concentrations between 20 and 40 at.%. Changes in short-range order have been observed by room-temperature electron diffraction experiments for Ge concentrations larger than 30 at.%. The d.c. electrical resistivity and the optical properties of the as-deposited amorphous metallic alloys are examined in detail as a function of composition. The Drude model with a constant relaxation time is found to reproduce the low-energy optical data satisfactorily. GRA

N85-10177# Ohio State Univ., Columbus. Dept. of Metallurgical Engineering.
INFLUENCE OF NITROGEN ON THE SENSITIZATION, CORROSION, MECHANICAL, AND MICROSTRUCTURAL PROPERTIES OF AUSTENITIC STAINLESS STEELS Progress Report
William A. T. Clark, Bryan E. Wilde, and Digby D. Macdonald Jul. 1984 84 p refs
(Contract DE-AC02-81BR-10972)
(DE84-015134; DOE/ER-10972/T3) Avail: NTIS HC A05/MF A01

In order to understand the mechanistic role of nitrogen and potential on the stress corrosion cracking (SCC) of austenitic stainless steels in high temperature wate, slow strain rate tests (SSRT) in fractography using scanning electron microscopy were carried out on austenitic stainless steels with various nitrogen contents. The main results obtained are summarized as follows: for all the steels tested an increase in the susceptibility to SCC is observed in the potential range -100 to 0 mV SHE; significant decreases in the elongation to failure and the change in the shape of the stress vs elongation curves just after reaching the maximum stress are indicators of an increased susceptibility to SCC in the potential range -100 to 0 mV SHE; a critical potential exists (-100 to 0 mV SHE) at which the elongation to failure ratio is a minimum; difference fracture morphologies were observed depending upon the applied potential. In general intergranular SCC was observed near the critical potential, transgranular SCC was observed at high potentials and ductile failure was observed at very high and very low potentials. Except at very low potentials a mixed mode of failure was observed; and near the critical potential

secondary cracks were observed on the side surface of the SSRT specimens. DOE

N85-10178# California Univ., Los Angeles.
RADIATION EFFECTS ON STRUCTURAL MATERIALS Technical Progress Report, 1 Jan. - 30 Jun. 1984
Nasr M. Ghoniem 1984 12 p refs
(Contract DE-FG03-84ER-52110)
(DE84-014771; DOE/ER-52110/T1) Avail: NTIS HC A02/MF A01

An analogous analysis for the growing void in which the actual motion of thevoid surface is incuded in a self consistent fashion is presented. The growing void sink strength using an embedding model valid for low sink densities is calculated. Some limiting analytic features of the solution are discussed and related evaluations of the general solution are discribed, using physical parameters appropiate for stainless steel. Also discussed is the practical relevance of the present growing void sink strength, together with its physical limitations and its significant. DOE

N85-10179# Westinghouse Research and Development Center, Pittsburgh, Pa.
STUDY TO OPTIMIZE Cr-Mo STEELS TO RESIST HYDROGEN AND TEMPER EMBRITTLEMENT. A STUDY OF CARBIDES FORMED IN LOW ALLOY Cr-Mo STEELS
B. J. Shaw 7 Feb. 1984 34 p refs
(Contract DE-AC05-78ET-13513)
(DE84-015208; DOE/ET-1353/T12; Topical-Rept-2) Avail: NTIS HC A03/MF A01

The role of composition on the carbides formed in low alloy Cr-Mo steels and proeutectoid ferrite is discussed. A method for the rapid evaluation of carbide type, using carbon extraction replicas on the scanning transmission electron microscope, is described in terms of a carbide compositional map. DOE

N85-10180# Argonne National Lab., Ill.
BIFOULING AND CORROSION STUDIES AT THE SEACOAST TEST FACILITY IN HAWAII
C. B. Panchal, H. S. Stevens (Hawaii Univ., Manoa), L. F. Genens (Natural Energy Lab. of Hawaii), D. L. Hillis, J. Larsen-Basse, S. Zaidi, and T. Daniel 1984 6 p refs Presented at OCEANS 1984 Conf. and Exposition, Washington, D.C., 10 Sep. 1984
(Contract W-31-109-eng-38)
(DE84-014643; CONF-840930-1) Avail: NTIS HC A02/MF A01

The rate and characteristics of biofouling and corrosion were investigated as part of the ocean thermal energy conversion research program. No detectable biofouling from cold water in smooth tubes was observed. Intermittent, low-level chlorination appears to control biofouling from warm water in smooth tubes. Uniform corrosion of 5052 aluminum alloy is low, with less pitting found with warm water than with cold water over the same period. Although the testing of waterside enhancements just began, results indicate that low-level chlorination may be effective in preventing biofouling buildup on such enhancements. Corrosion data indicate that aluminum-based materials may achieve long service lives in marine environments. R.S.F.

N85-10181# Bureau of Mines, Avondale, Md. Research Center.
METHODS FOR PRODUCING PLATINUM-GROUP METAL COATINGS FROM MOLTEN ALKALI CYANIDES
Richard P. Walters and David R. Flinn 1984 24 p refs
(PB84-225994; BU-IC-8974; LC-84-60022) Avail: NTIS HC A02/MF A01 CSCL 11C

The technology for preparing electrodeposited coatings of the platinum-group metals from molten alkali metal cyanide baths are reviewed and assessed. Methods are described for the preparation and purification of the cyanide electrolyte. Vacuum drying, fusion, and purity of the cyanide salts are discussed. Use of a sodium borosilicate test tube as a sodium-ion-conducting membrane for the addition of the desired platinum-group metal is described. The optimum plating parameters of potential and current density for Pt, Pd, Rh, Ru, and Ir coatings that result in the best deposits are given. A method for producing platinum-rhodium alloy coatings of predetermined composition is also described. The importance of careful substrate surface preparation is illustrated. While problems still remain with respect to coating porosity, careful application of the methods described permits the preparation of adherent, coherent electrodeposited coatings of the platinum-group metals. GRA

N85-10182# Atomic Energy Research Establishment, Harwell (England). Materials Development Div.
THE OXIDATION BEHAVIOUR OF A 20 PERCENT Cr/25 PERCENT Ni/Nb STABILIZED STAINLESS STEEL IN CARBON DIOXIDE AT HIGH TEMPERATURES AND ITS IMPROVEMENT BY CERIUM AND YTTRIUM
M. J. Bennett, J. B. Price, and D. J. Savage Apr. 1984 49 p refs
(AERE-R-11228; AGR/FPWC/P(84)422) Avail: NTIS HC A03/MF A01

The isothermal oxidation behavior of the 20% Cr/25% Ni niobium stabilized (20/25/Nb) stainless steel during 195-785h exposure in carbon dioxide has been examined at 900-1050C. The growth, breakdown and spallation of the oxide scales formed has been followed, while scale topography and composition has been investigated by SEM, XRD and EPMA. The effectiveness of an alloy addition of 0.13% Ce upon the oxidation behavior of the 20/25/Nb steel has been assessed and compared with that of cerium (and also yttrium) surface ion implantation. Author

N85-10183# Atomic Energy Research Establishment, Harwell (England). Materials Development Div.
USER EXPERIENCE OF EXISTING CORROSION MONITORING TECHNIQUES AND THE DEVELOPMENT OF THIN LAYER ACTIVATION (TLA) FOR CORROSION MONITORING
B. C. Tofield and C. F. Britton Mar. 1984 21 p refs Presented at the 2nd Intern. Conf. on Corrosion Monitoring and Inspection in the Oil, Petrochem. and Process Ind., London, 16-17 Feb. 1984
(AERE-R-11248) Avail: NTIS HC A02/MF A01

The requirements for successful introduction and operation of a corrosion monitoring (CM) system are discussed. Corrosion monitoring must be considered in a systematic and integrated manner with other plant design and operation functions. Although individual CM techniques should be rugged, reliable, and easy to use, corrosion expertise is necessary both in designing the system and in assessing the results and instituting and monitoring any corrective action. Most successful CM systems employ a range of monitoring techniques. Data from a recent survey are presented to provide an overview of current practice (1981) in plant corrosion monitoring and user experience with available corrosion monitoring equipment. This is, in fact, the first, unbiased such survey covering a wide range of industries. In the light both of the requirements for CM, and of the user experience, prospects and opportunities for new techniques are assessed. It is considered that thin layer activation (TLA) is a particularly promising technique. Author

N85-10111# Joint Publications Research Service, Arlington, Va.
EFFECT OF SCANDIUM ON THE STRUCTURE AND PROPERTIES OF Al-Zn-Mg ALLOYS Abstract Only
V. I. Yelagin, V. V. Zakharov, A. A. Petrova, and Ye. V. Vyshegorodtseva *In its* USSR Rept.: Mater. Sci. and Met., No. 93 (JPRS-84810) 25 Nov. 1983 p 1 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Metally (Moscow), no. 4, Jul. - Aug. 1983 p 180-183 (For primary document see N85-10110 01-23)
Avail: NTIS HC A04

N85-10112# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF ALUMINUM METALLIZATION COATINGS ON CORROSION FATIGUE PROPERTIES OF STEEL Abstract Only
I. N. Katkov, I. P. Pistun, A. B. Kuslitskiy, M. A. Glevoba, and V. N. Kovlenko *In its* USSR Rept.: Mater. Sci. and Met., No. 93 (JPRS-84810) 25 Nov. 1983 p 5-6 Transl. into ENGLISH from Zashchita Metallov (Moscow), v. 19, no. 4, Jul. - Aug. 1983

p 596-598 (For primary document see N85-10110 01-23)
Avail: NTIS HC A04

N85-10113# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF PARAMETERS OF ALUMIMUN ALLOY ANODIZING PROCESS ON OXIDE COATING THICKNESS Abstract Only
A. V. Karlashov, L. N. Kosinskaya, Yu. P. Masyuk, and A. D. Gnatyuk *In its* USSR Rept.: Mater. Sci. and Met., No. 93 (JPRS-84810) 25 Nov. 1983 p 6 Transl. into ENGLISH from Zashchita Metallov (Moscow), v. 19, No. 4, Jul. - Aug. 1983 p 570-573 (For primary document see N85-10110 01-23)
Avail: NTIS HC A04

N85-10114# Joint Publications Research Service, Arlington, Va.
NEW FERROUS METALLURGY TECHNOLOGY Abstract Only
In its USSR Rept.: Mater. Sci. and Met., No. 93 (JPRS-84810) 25 Nov. 1983 p 7-11 Transl. into ENGLISH from Ekon. Gazeta (Moscow), no. 34, Aug. 1983 p 2 (For primary document see N85-10110 01-23)
Avail: NTIS HC A04

N85-10115# Joint Publications Research Service, Arlington, Va.
THERMAL FATIGUE OF GAS TURBINE ENGINE BLADES MADE OF MATERIAL BASED ON SILICON NITRIDE AND SILICON CARBIDE Abstract Only
G. N. Tretyachenko, B. S. Karpinos, and B. D. Kosov *In its* USSR Rept.: Mater. Sci. and Met., No. 93 (JPRS-84810) 25 Nov. 1983 p 16 Transl. into ENGLISH from Probl. Prochnosti (Kiev), no. 7, Jul. 1983 p 9-12 (For primary document see N85-10110 01-23)
Avail: NTIS HC A04

N85-10116# Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF POWDER METALLURGY IN VARIOUS SECTIONS OF USSR
P. Koblikov *In its* USSR Rept.: Mater. Sci. and Met., No. 93 (JPRS-84810) 25 Nov. 1983 p 17-18 Transl. into ENGLISH from Sov. Molodezh (Riga), 16 Jul. 1983 p 2 (For primary document see N85-10110 01-23)
Avail: NTIS HC A04

N85-10117# Joint Publications Research Service, Arlington, Va.
GRANULAR BOUNDARY SEGREGATION IN LOW-ALLOYED TITANIUM-VANADIUM ALLOYS Abstract Only
C. I. Kolodkina, I. I. Kryukova, A. I. Rybnikov, and S. S. Ushkov *In its* USSR Rept.: Mater. Sci. and Met., No. 93 (JPRS-84810) 25 Nov. 1983 p 30 Transl. into ENGLISH from Fiz. Metallov i Metallovedeniye (Sverdlovsk, USSR), v. 56, no. 1, Jul. 1983 p 160-164 (For primary document see N85-10110 01-23)
Avail: NTIS HC A04

N85-10118# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF ANNEALING ON PROPERTIES OF AT3 ALLOY WELDED JOINTS Abstract Only
G. M. Shelenkov, V. E. Troyanovskiy, V. Ye. Blashuk, L. M. Onopriyenko, G. Ye. Boyeva, and R. K. Melekhov *In its* USSR Rept.: Mater. Sci. and Met., No. 93 (JPRS-84810) 25 Nov. 1983 p 32 Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 6, Jun. 1983 p 53-55, 66 (For primary document see N85-10110 01-23)
Avail: NTIS HC A04

N85-10119# Joint Publications Research Service, Arlington, Va.
HEAT TREATMENT OF WELDED JOINTS IN OT4 AND VT20 TITANIUM ALLOYS Abstract Only
M. A. Khorev, Yu. V. Gusev, and N. K. Gribova *In its* USSR Rept.: Mater. Sci. and Met., No. 93 (JPRS-84810) 25 Nov. 1983 p 33 Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 7, Jul. 1983 p 19-23 (For primary document see N85-10110 01-23)
Avail: NTIS HC A04

N85-10120# Joint Publications Research Service, Arlington, Va.
STRENGTH OF WELDED JOINTS IN VT23 ALLOY UPON REPEATED STATIC LOADING Abstract Only
V. F. Topolskiy, S. I. Kishkina, L. A. Stronina, A. I. Khorev, Yu. D. Mikhalev, and V. Y. Leontyev *In its* USSR Rept.: Mater. Sci. and Met., No. 93 (JPRS-84810) 25 Nov. 1983 p 33-34 Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 7, Jul. 1983 p 42-44 (For primary document see N85-10110 01-23)
Avail: NTIS HC A04

N85-10122# Joint Publications Research Service, Arlington, Va.
FEATURES OF LASER WELDING OF MEDIUM CARBON STEEL THROUGH A CADMIUM COATING Abstract Only
A. A. Uglov and V. I. Ofer *In its* USSR Rept.: Mater. Sci. and Met., No. 93 (JPRS-84810) 25 Nov. 1983 p 35-36 Transl. into ENGLISH from Fiz. i Khim. Obrabotki Materialov (Moscow), no. 4, Jul. - Aug. 1983 p 17-21 (For primary document see N85-10110 01-23)
Avail: NTIS HC A04

N85-10125# Joint Publications Research Service, Arlington, Va.
WELDABILITY OF AGED HEAT RESISTANT NICKEL ALLOYS Abstract Only
L. I. Sorokin *In its* USSR Rept.: Mater. Sci. and Met., No. 93 (JPRS-84810) 25 Nov. 1983 p 37-38 Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 7, Jul. 1983 p 12-16 (For primary document see N85-10110 01-23)
Avail: NTIS HC A04

N85-10126# Joint Publications Research Service, Arlington, Va.
NEW METALLURGICAL PROCESSES BASED ON HIGH-SPEED CRYSTALLIZATION AND DIFFUSION OF METALS
A. F. Belov *In its* USSR Rept.: Mater. Sci. and Met., No. 93 (JPRS-84810) 25 Nov. 1983 p 39-51 refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Metally (Moscow), no. 6, Nov. - Dec. 1982 p 11-20 (For primary document see N85-10110 01-23)
Avail: NTIS HC A04

N85-10216# Joint Publications Research Service, Arlington, Va.
ELECTRO-SPARK CASE-HARDENING OF CONTOURED SURFACES
V. L. Andreyev, V. I. Kerevyenko, and N. I. Beda *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-84-019) 30 Oct. 1984 p 15-17 Transl. into ENGLISH from Mashinostroitel (Moscow), no. 4, Apr. 1984 (For primary document see N85-10214 01-31)
Avail: NTIS HC A03

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N85-10184 Department of the Air Force, Washington, D.C.
METHOD FOR THE PREPARATION OF POLY(CARBONYL FLUORIDE) OLIGOMERS Patent
K. B. Baucom, inventors (to Air Force) and B. N. Hamon Issued 17 Jul. 1984 4 p
(AD-D011207; US-Patent-4,460,514; US-Patent-Appl-SN-418951)
Avail: US Patent and Trademark Office CSCL 07/3

This patent describes an improved method for synthesizing poly(carbonyl fluoride) oligomers by using bis(trifluoromethyl)trioxide as a reaction initiator in the photo-oxidation of F-3 methylbutene-1. GRA

N85-10185# City Coll. of the City Univ. of New York. Dept. of Physics.
CRITICAL CONDITIONS FOR THE GROWTH OF SiC, Si3N4, AND SiO2 Final Report
Frederick W. Smith May 1984 5 p
(Contract DE-AC02-79ER-10438)

(DE84-014824; DOE/ER-10438/8) Avail: NTIS HC A02/MF A01

Previous results obtained in a high vacuum (HV) system were confirmed under ultra high vacuum (UHV) conditions. Results for the interaction of O2 with Si are consistent with a model focusing on the kinetics of SiO2 cluster growth and the thermodynamics of the competing etching reaction leading to production of the volatile SiO molecule. The initial growth of SiO2 on heavily phosphorus doped Si occurs for lower values of P(O2) than on intrinsic Si. Interaction of H2O with Si leading to the growth of SiO2 can be undestood in terms of a thermodynamic model modified to include effects due to H2O dissociation and SiO desorption. The interaction of NO with Si at high T, leading to the formation of silicon nitride at high NO pressures, has 100% probability for the occurrence of the reaction NO + Si (YIELDS) N + SiO, per incident NO molecule. DOE

N85-10186*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

CERAMIC MICROSTRUCTURE AND ADHESION

Donald H. Buckley 1984 33 p refs To be presented at the 31st Natl. Am. Vacuum Soc. Symp., Reno, Nevada, 4-7 Dec. 1984

(NASA-TM-83804; E-2311; NAS 1.15:83804) Avail: NTIS HC A03/MF A01 CSCL 11B

When a ceramic is brought into contact with a ceramic, a polymer, or a metal, strong bond forces can develop between the materials. The bonding forces will depend upon the state of the surfaces, cleanliness and the fundamental properties of the two solids, both surface and bulk. Adhesion between a ceramic and another solid are discussed from a theoretical consideration of the nature of the surfaces and experimentally by relating bond forces to interface resulting from solid state contact. Surface properties of ceramics correlated with adhesion include, orientation, reconstruction and diffusion as well as the chemistry of the surface specie. Where a ceramic is in contact with a metal their interactive chemistry and bond strength is considered. Bulk properties examined include elastic and plastic behavior in the surficial regions, cohesive binding energies, crystal structures and crystallographic orientation. Materials examined with respect to interfacial adhesive interactions include silicon carbide, nickel zinc ferrite, manganese zinc ferrite, and aluminum oxide. The surfaces of the contacting solids are studied both in the atomic or molecularly clean state and in the presence of selected surface contaminants. Author

N85-10187*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

STABILITY OF BROMINE INTERCALATED GRAPHITE FIBERS

James R. Gaier 28 Nov. 1984 11 p refs To be presented at the Mater. Res. Soc. Symp., Boston, 28-30 Nov. 1984; sponsored by the Am. Phys. Soc.

(NASA-TM-86859; E-2322; NAS 1.15:86859) Avail: NTIS HC A02/MF A01 CSCL 11D

Previous evidence suggested that bromine intercalation compounds of crystalline graphite spontaneously deintercalate when the bromine atmosphere is removed. However, results show that bromine intercalated P-100 graphite fibers are stable for long periods of time. They are stable under vacuum conditions, high humidity, and current densities up to 24,000 A/sq cm. They are thermally stable to 200 C, and at temperatures as high as 400 C still retain 80 percent of the conductivity gained by intercalation. At temperatures greater than 300 C, there is significant oxidative degradation of the fibers. The environmental stability shown by the bromine compound makes it a promising candidate for practical applications in aerospace technology. R.S.F.

N85-10188*# National Aeronautics and Space Administration, Washington, D. C.

PROCESSING CERAMICS

M. Moritoki, T. Fujikawa, and J. Miyanaga Aug. 1984 13 p Transl. into ENGLISH of Japanese Patent No. 58-88179, 26 May 1983 p 411-414 Transl. by Scientific Translation Service, Santa Barbara, Calif.

(Contract NASw-3542)

(NASA-TM-77603; NAS 1.15:77603) Avail: NTIS HC A02/MF A01 CSCL 11B

A method of hot hydrostatic pressing of ceramics is described. A detailed description of the invention is given. The invention is explained through an example, and a figure illustrates the temperature and pressure during the hot hydrostatic pressing treatment. Author

N85-10189*# National Aeronautics and Space Administration, Washington, D. C.

FABRICATION AND CHARACTERIZATION OF SI3N4 CERAMICS WITHOUT ADDITIVES BY HIGH PRESSURE HOT PRESSING

Masahiko Shimada, Atsuhiko Tanaka (Ube Industries Ltd., Japan), Testuo Yamada (Ube Industries Ltd., Japan), and Mitsue Koizumi Aug. 1984 14 p refs Transl. into ENGLISH from Zairyo (J. of Japan Soc. of Mater. Sci.) (Japan), v. 31, Oct. 1982 p 967-972 Original language doc. previously announced in IAA as A83-14920 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Osaka Univ., Ibaraki, Japan

(Contract NASw-3541)

(NASA-TM-77724; NAS 1.15:77724) Avail: NTIS HC A02/MF A01 CSCL 11B

High pressure hot-pressing of Si3N4 without additives was performed using various kinds of Si3N4 powder as starting materials, and the relation between densification and alpha-beta phase transformation was studied. The temperature dependences of Vickers microhardness and fracture toughness were also examined. Densification of Si3N4 was divided into three stages, and it was found that densification and phase transformation of Si3N4 under pressure were closely associated. The results of the temperature dependence of Vickers microhardness indicated that the high-temperature hardness was strongly influenced not only by the density and microstructure of sintered body but also by the purity of starting powder. The fracture toughness values of Si3N4 bodies without additives were 3.29-4.39 MN/m to the 3/2 power and independent of temperature up to 1400 C. Author

N85-10190*# National Aeronautics and Space Administration, Washington, D. C.

SEALING CERAMIC MATERIAL IN LOW MELTING POINT GLASS

Masahito Moritoki, Takao Fujikawa, and Junichi Miyanaga Aug. 1984 10 p Transl. into ENGLISH of Japanese Patent No. 58-88180 (26 May 1983) Transl. by Kanner (Leo) Associates, Redwood City, Calif.

(Contract NASw-3541)

(NASA-TM-77599; NAS 1.15:77599) Avail: NTIS HC A02/MF A01 CSCL 11B

A structured device placed in an aerated crucible to pack ceramics molding substance that is to be processed was designed. The structure is wrapped by sealing material made of pyrex glass and graphite foil or sheet with a weight attached on top of it. The crucible is made of carbon; the ceramics material to be treated through heat intervenient press process is molding substance consisting mainly of silicon nitride. E.A.K.

N85-10191*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

MILLING OF SI3N4 WITH SI3N4 HARDWARE

Thomas P. Herbell, Marc R. Freedman, and James D. Kiser Washington 1984 20 p refs Presented at the 13th Intern. Gas Turbine Conf., Houston, Tex., 17-21 Mar. 1984; sponsored by American Society of Mechanical Engineers

(NASA-TM-86864; E-2328; NAS 1.15:86864) Avail: NTIS HC A02/MF A01 CSCL 11G

The grinding of Si3N4 powder using reaction bonded Si3N4 attrition, vibratory, and ball mills with Si3N4 media was examined. The rate of particle size reduction and the change in the chemical composition of the powder were determined in order to compare the grinding efficiency of each technique and the increase in impurity content resulting from mill and media wear. Attrition and vibratory milling exhibited rates of specific surface area increase

that were approximately eight times that observed in ball milling. Ball milling and attrition milling provided the least contamination while vibratory milling introduced the greatest amount of impurity pickup. Author

N85-10192*# Trinity Coll., Dublin (Ireland).
NUCLEAR MAGNETIC RESONANCE OF POLYMERIC MATERIALS
1983 118 p Proc. of the Autumn Meeting of the British Radiofrequency Group, Dublin
(AD-A145078) Avail: NTIS HC A06/MF A01 CSCL 20/8

The dynamics of polymers in solution and melts are discussed along with nuclear magnetic resonance (NMR) and macromolecular migration in a melt or in concentrated solutions. In addition, NMR studies of solid polyolefins, deutron NMR in relation to the glass transition in polystyrene, the theory of nuclear magnetic relaxation, and NMR studies of solid proteins are presented. For individual titles, see N85-10193 through N85-10198.

N85-10193*# Cambridge Univ. (England).
DYNAMICS OF POLYMERS IN SOLUTION AND MELTS
S. F. Edwards *In* Trinity Coll. Nucl. Magnetic Resonance of Polymeric Mater. 1983 19 p (For primary document see N85-10192 01-27)
(AD-P003907) Avail: NTIS HC A06/MF A01 CSCL 11/9

Simple models of polymer dynamics are available in dilute solution, moderate concentrations and melts, since it is possible to make models of the motion in these cases. A series of power laws result which fit well with computer simulation. It is more difficult to derive these models directly from sensible equations of motion, but progress in this direction is reported in the paper. Author (GRA)

N85-10194*# Grenoble-1 Univ., Annecy (France). Spectrometrie Physique.
NMR (NUCLEAR MAGNETIC RESONANCE) AND MACROMOLECULAR MIGRATION IN A MELT OR IN CONCENTRATED SOLUTIONS
J. P. C. Addad *In* Trinity Coll. Nucl. Magnetic Resonance of Polymeric Mater. 1983 22 p (For primary document see N85-10192 01-27)
(AD-P003908) Avail: NTIS HC A06/MF A01 CSCL 20/8

The purpose of this paper is to analyze the migration process of long polymer molecules in a melt or in concentrated solutions as it may be observed from the dynamics of the transverse magnetization of nuclear spins linked to these chains. The low frequency viscoelastic relaxation of polymer systems is known to be mainly controlled by the mechanism of dissociation of topological constraints excited on chains and which are called entanglements. This mechanism exhibits a strong dependence upon the chain molecular weight. These topological constraints also govern the diffusion process of polymer chains. So, the accurate description of the diffusion motion of a chain may be a convenient way to characterize disentanglement processes necessarily involved in any model proposed to explain viscoelastic effects. GRA

N85-10195*# East Anglia Univ., Norwich (England). School of Chemical Sciences.
13C AND 1H NMR (NUCLEAR MAGNETIC RESONANCE) STUDIES OF SOLID POLYOLEFINES
M. E. A. Cudby, R. K. Harris, K. Metcalfe, K. J. Packer, and P. W. R. Smith *In* Trinity Coll. Nucl. Magnetic Resonance of Polymeric Mater. 1983 32 p (For primary document see N85-10192 01-27)
(AD-P003909) Avail: NTIS HC A06/MF A01 CSCL 20/8

The basis of H-1 and C-13 high-resolution NMR investigations of solid polymers is outlined. The C-13 NMR spectra of solid syndiotactic and isotactic polypropene are discussed and their interpretation in terms of conformation and chain-packing effects are reviewed. The effects of decreasing temperature on the C-13 high-resolution spectrum of an annealed sample of isotactic polypropene is described and interpreted in terms of the crystal structure. The question of the proportion of the sample giving rise to C-13 signals is addressed and some results reported. The main cause for observing only part of the total sample is shown to be the H-1 rotating frame spin-lattice relaxation behavior. The H-1 spin-lattice relaxation and spectral characteristics of a number of polyolefin samples are summarized and the role of spin-diffusion discussed. GRA

N85-10196*# Johann-Wolfgang-Goethe-Univ., Frankfurt am Main (West Germany).
DEUTERON NMR (NUCLEAR MAGNETIC RESONANCE) IN RELATION TO THE GLASS TRANSITION IN POLYMERS
E. Roessler, H. Sillescu, H. W. Spiess, and R. Wallwitz *In* Trinity Coll. Nucl. Magnetic Resonance of Polymeric Mater. 1983 21 p (For primary document see N85-10192 01-27)
(AD-P003910) Avail: NTIS HC A06/MF A01 CSCL 20/8

H-2NMR is introduced as a tool for investigating slow molecular motion in the glass transition region of amorphous polymers. In particular, we compare H-2 spin alignment echo spectra of chain deuterated polystyrene with model calculations for restricted rotational Brownian motion. Molecular motion in the polyztyrene-toluene system has been investigated by analyzing H-2NMR of partially deuterated polystyrene and toluene, respectively. The diluent mobility in the mixed glass has been decomposed into solid and liquid components where the respective average correlation times differ by more than 5 decades. Author (GRA)

N85-10197*# Dublin Inst. for Advanced Studies (Ireland).
THEORY OF NUCLEAR MAGNETIC RELAXATION
J. McConnell *In* Trinity Coll. Nucl. Magnetic Resonance of Polymeric Mater. 1983 16 p (For primary document see N85-10192 01-27)
(AD-P003911) Avail: NTIS HC A06/MF A01 CSCL 20/8

A theory of nuclear magnetic interaction is based on the study of the stochastic rotation operator. The theory is applied explicitly to relaxation by anisotropic chemical shift and to spin-rotational interactions. It is applicable also to dipole-dipole and quadrupole interactions. Author (GRA)

N85-10198*# Florida Univ., Gainesville.
NMR (NUCLEAR MAGNETIC RESONANCE) OF SOLID BIOPOLYMERS
E. R. Andrew *In* Trinity Coll. Nucl. Magnetic Resonance of Polymeric Mater. 1983 10 p (For primary document see N85-10192 01-27)
(AD-P003912) Avail: NTIS HC A06/MF A01 CSCL 20/8

It has been possible through the study of proton relaxation in solid proteins and related molecules to identify and characterize the following molecular motions which contribute to relaxation: (1) methyl group reorientation; (2) segmental motion; (3) side chain motion; (4) proline ring puckering; and (5) water molecule reorientation. GRA

N85-10199# Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
SELECTING THE PROPER CERAMIC MATERIAL FOR A REGENERATOR EXPERIENCING LARGE TEMPERATURE GRADIENTS M.S. Thesis
M. Y. Kikuta Jun. 1984 153 p
(Contract N66314-70-A-0073)
(AD-A144796) Avail: NTIS HC A08/MF A01 CSCL 11/2

The objective of this study is to select the optimum ceramic material for a new engine regenerator. The regenerator will be designed for operation at two working temperatures, a compressed air temperature of about 250 C and an exhaust gas temperature of about 1100 C. Candidate ceramic materials considered were of two types: (1) ceramic materials analyzed for operating temperatures up to 1200 C; and (2) ceramic materials analyzed for operating temperatures between 1200 C and 1400 C. A figure of merit (FOM) rating scheme was used to determine the most suitable ceramic material for the regenerator in terms of mechanical, thermal, fabrication and cost parameters. Also, an analysis was performed to determine the most appropriate regenerator passage geometry on an aero-thermodynamic basis. GRA

N85-10200# Massachusetts Univ., Amherst. Dept. of Polymer Science and Engineering.
EQUIBIAXIAL EXTENSION OF TWO POLYMER MELTS: POLYSTYRENE AND LOW DENSITY POLYETHYLENE
J. C. W. Chien, P. R. Soskey, and H. H. Winter 21 Jul. 1984 37 p
(Contract N00014-83-K-0083)
(AD-A144893) Avail: NTIS HC A03/MF A01 CSCL 11/9

Stress relaxation after rapid extensional strain was measured to obtain the extensional relaxation modulus. The time dependence of the relaxation modulus was found to be the same in extension as in shear, given by the relaxation modulus of linear viscoelasticity. The strain dependence was markedly different than in shear. Separation of time and strain dependence into a product of two functions is suggested by the experimental results. This is a strong support for the separability assumption and simplifies the formulation of rheological constitutive equations. A polymer with linear macromolecules exhibited much stronger strain dependence than a polymer with long chain branched macromolecules. The parameters of an integral constitutive equation were determined in rapid strain experiments and the constitutive equation was tested experimentally with stress growth at start-up of equibiaxial extension. Equibiaxial extensional flow was generated with a Rheometrics RDS-LA, using the lubricated squeezing technique. GRA

N85-10201# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemical Engineering.
DIBLOCK COPOLYMERS OF POLYSTYRENE/1,2 POLYBUTADIENE AND POLYSTYRENE/POLYBUTENE-1: MOLECULAR STRUCTURE, MORPHOLOGY AND MECHANICAL PROPERTIES
R. E. Cohen and J. M. Torrades 15 Aug. 1984 30 p
(Contract N00014-77-C-0311)
(AD-A144980; TR-13) Avail: NTIS HC A03/MF A01 CSCL 11/9

A novel set of diblock copolymers has been examined in various molecular and morphological characterization experiments, in small amplitude dynamic mechanical tests and in large deformation experiments. In all of the materials studied, one of the block sequences is atactic polystyrene; the second block is comprised of either 1,2 polybutadiene (essentially 100% vinyl adduct and atactic microstructure) or its hydrogenated product, polybutene-1 (also atactic). There is a pronounced influence of the hydrogenation of the rubbery phase on the morphology and the properties of the diblock copolymers. GRA

N85-10202# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
METHOD OF OBTAINING HETEROCYCLIC POLYMERS
L. I. Chudina, K. N. Vlasova, S. I. Litovchenko, N. P. Bordyukova, and N. F. Sedova 7 Aug. 1984 6 p Transl. into ENGLISH of Russian Patent No. 378397 (18 Apr. 1973) p 1-2
(AD-A145127; FTD-ID(RS)T-0795-84) Copyright. Avail: NTIS HC A02/MF A01 CSCL 11/9

A method to obtaining heterocyclic polymers with a cross-linked structure by polycondensation of dianhydrides of tetracarboxylic acids with diamines is presented. Subsequent interaction of the polyamido acid is obtained with the anhydridt of unsaturated dicarboxylic acid. The purpose of the improvement is to obtain the chemical stability of the polymers obtained, by use of diamines which contain oxadiazole, oxazole benzimidazole cycles, and mixtures of aromatic diamines. E.A.K.

N85-10203# Department of Energy, Washington, D. C.
ELECTRICALLY CONDUCTIVE RIGID POLYURETHANE FOAM Patent Application
Thomas E. Neet and David A. Spieker, inventors (to DOE) Filed 8 Dec. 1983 12 p
(Contract DE-AC04-76DP-00613)
(DE84-014490; US-Patent-Appl-SN-559502) Avail: NTIS HC A02/MF A01

A rigid, moldable polyurethane foam is described which comprises about 2 to 10 weight percent, based on the total foam weight, of a carbon black which is CONDUCTEX CC-40-220 or CONDUCTEX SC. The rigid polyurethane foam is electrically conductive and has essentially the same mechanical properties as the same foam without carbon black added. B.W.

N85-10204# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Metallurgy and Materials Science.
FUNDAMENTAL STUDIES OF STRUCTURE PROPERTY RELATIONSHIP IN TRANSFORMATION TOUGHENED CERAMICS Final Report
A. H. Heuer 15 May 1984 13 p refs
(Contract DE-AC02-83ER-45006)
(DE84-015344; DOE/ER-45006/1) Avail: NTIS HC A02/MF A01

Research was performed in three areas: Ostwald ripening in ZrO2-toughened Al2O3 (ZTA), plastic deformation in stabilized ZrO2 single crystals, and stress induced phase transformations in Y2O3 containing tetragonal ZrO2 polycrystals (Y-TZP). Results and conclusions for each area is discussed. DOE

N85-10205# General Research Corp., Oklahoma City, Okla.
ABRASIVE PRODUCTS STUDY
May 1984 107 p
(Grant EDA-08-06-02341)
(PB84-223635; EDA-84-038) Avail: NTIS HC A06/MF A01 CSCL 11K

A detailed examination of the coated abrasive conversion industry is presented. The examinations are summarized in three classes: product analyses, market analyses, and profitability analyses. GRA

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N85-10206 Department of the Air Force, Washington, D.C.
PORTABLE SLOTTING DEVICE Patent
H. H. Erhard Issued 31 Jul. 1984 6 p Supersedes AD-D010052 (AD-D011213; US-Patent-4,462,286; US-Patent-Appl-SN-452605; US-Patent-Class-82-1.4) Avail: US Patent and Trademark Office CSCL 13/9

A portable slotting device is used to cut a conical slot in a propellant grain off a rocket motor. A telescoping arm having a cutter thereon is mounted at an angle upon a rotating shaft held in position by a housing attached to said motor. Pressurized fluid is fed to the telescoping arm for providing the motive force to extend the cutter. A control cable is attached to one of two extension arms in the telescoping arm and to an adjusting knob. As the drive shaft is rotated, the adjusting knob is unthreaded from a rod having the control cable attached thus allowing the control cable to extend the telescoping arm. The pressurized fluid forces the extension arms out while the control cable restrains movement. The cutter thus moves in a spiraling conical motion paring out propellant grain. GRA

N85-10207 Prins Maurits Lab. TNO, Rijswijk (Netherlands).
COMPUTER SIMULATION OF THE SHOCK INITIATION OF DETONATION IN SOLID EXPLOSIVES [COMPUTERSIMULATIE VAN DE SCHOKINITIATE VAN DETONATIE IN VASTE SPRINGSTOFFEN]
W. L. Bolle and R. R. Ijsselstein 1984 64 p refs In DUTCH; ENGLISH summary
(Contract A78/KL/009)
(PML-1984-23; TDCK-79374) Copyright. Avail: Issuing Activity

The shock initiation of detonation in high explosives was simulated by the continuum dynamics program TODY. An expression for the reaction rate was obtained from the Forest Fire model for which a separate program was implemented. For a simple

geometry the initiation of and the build-up to stationary detonation is simulated with reasonable success. Simulations of stationary propagation of a detonation wave are carried out with the original TODY version, thereby investigating the influence of numerical parameters. The listing of the Forest Fire computer program is given. Author (ESA)

N85-10208# College of Eastern Montana, Billings. Dept. of Natural Sciences.
PROSPECTUS OF THE UTILIZATION OF LEAFY SPURGE (EUPHORBIA ESULA L.) AS A SOURCE OF LIQUID FUEL AND BIOMASS Final Report
Stanley M. Wiatr 1984 63 p
(Contract DE-FG48-81R8-03006)
(DE84-015203; DOE/R8-03006/T1) Avail: NTIS HC A04/MF A01

The biomass potential of leafy spurge (Euphorbia esula) was investigated. Whole plant biomass yields of 3.6 to 4.9 dry weight tons per acre were obtained from late summer harvests of wild stands in southcentral Montana. Shoot biomass comprised 70% of the harvest with the remainder derived from the basal crowns and first 20 to 30 cm of rootstock. Total biomass was comprised of the following components: oils, 3.6% polyphenols, 6.8%; soluble sugars, 6.1%; starch, 1.1% and protein, 7.1%. Lignin and crude fiber were major biomass components. Euphorbia esula does not presently constitute a productive source of whole plant, extractable oils. Alternative uses of E. esula are not dismissed due to the favorable net energy yield calculated for wild stands of this species. Suggested uses include conversion of whole plant biomass to biocrude oil or a multiple use approach to the use of E. esula biomass as a primary source of lignin and crude fiber, and secondary raw materials consisting of extractable oils, polyphenols, protein and fermentable carbohydrates. DOE

N85-10209*# SRI International Corp., Menlo Park, Calif.
CHEMISTRY OF FUEL DEPOSITS AND SEDIMENTS AND THEIR PREDURSORS Final Report
Frank R. Mayo, Bosco Y. Lan, S. E. Buttrill, Jr., and G. A. St.John Oct. 1984 50 p refs
(Contract NAS3-22510)
(NASA-CR-174778; NAS 1.26:174778; YU-2115) Avail: NTIS HC A03/MF A01 CSCL 21D

The mechanism of solid deposit formation on hot engine parts from turbine fuels is investigated. Deposit formation is associated with oxidation of the hydrocarbon fuel. Therefore, oxidation rates and soluble gum formation were measured for several jet turbine fuels and pure hydrocarbon mixtures. Experiments were performed at 130 C using thermal initiation and at 100 C using ditertiary butyl peroxide as a chemical initiator. Correlation of the data shows that the ratio of rate of oxidation to rate of gum formation for a single fuel is not much affected by experimental conditions, even though there are differences in the abilities of different hydrocarbons to initiate and continue the oxidation. This indicates a close association of gum formation with the oxidation process. Oxidations of n-dodecane, tetralin and the more unstable jet fuels are autocatalytic, while those of 2-ethylnaphthalene and a stable jet fuel are self-retarding. However, the ratio of oxidation rate to gum formation rate appear to be nearly constant for each substrate. The effect of oxygen pressure on gum and oxidation formation was also studied. Dependence of gum formation on the concentration of initiator at 100 C is discussed and problems for future study are suggested. Author

N85-10210# Army Missile Command, Redstone Arsenal, Ala. Propulsion Directorate.
A MODEL FOR GRAIN MISALIGNMENT IN CYLINDRICAL PORT MOTORS
J. S. Lilley Apr. 1984 64 p
(AD-A144856; AD-E950554; DRSMI/RK-84-4-TR) Avail: NTIS HC A04/MF A01 CSCL 21/8

This report presents a mathematical model of the geometry of the propellant grain of a cylindrical port motor cast with a misaligned mandrel. Also presented is an HP-41C calculator program which incorporates this model, and an example demonstrating the application of the misaligned motor geometry. Author (GRA)

N85-10211# Mueller Associates, Inc., Baltimore, Md.
STATUS OF GASEOUS FUELS FOR USE IN HIGHWAY TRANSPORTATION: A 1983 PERSPECTIVE
Richard L. Bechtold and Thomas J. Timbario Nov. 1983 98 p refs
(Contract DE-AC05-79CS-56051)
(DE84-015205; DOE/CS-56051/10) Avail: NTIS HC A05/MF A01

The current status of the technologies of gaseous fuels utilization in highway transportation vehicles is reviewed. The use of natural gas is included as well as liquefied petroleum gases (LPG). The results of engine and vehicle testing using gaseous fuels are presented and discussed. Topics explored include fuel properties, storage tank materials compatibility, power output, exhaust emissions, road use taxes, vehicle refueling characteristics, crash test data, vehicle accident file analyses, operating range and vehicle performance. Special emphasis is placed on assessments of the safety of gaseous fuels compared to gasoline and diesel fuel and of the institutional barriers impeding the widespread implementation of gaseous fueled vehicles. Possible new developments in gaseous fueled vehicle technology such as methane absorbents, advanced gaseous fuel systems, optimum engine design to best make use of the properties of gaseous fuels, refueling techniques and advanced gaseous fuel vehicle design concepts are presented and discussed. Areas of gaseous fuel vehicle technology which would benefit from additional research are identified. DOE

N85-10212# Naval Research Lab., Washington, D. C. Combustion Fuels Branch.
MECHANISMS OF SYNCRUDE-SYNFUEL DEGRADATION Annual Report, 1 Oct. 1982 - 30 Sep. 1983
John V. Cooney, Robert N. Hazlett, and Erna J. Beal May 1984 122 p refs
(Contract DE-AI19-81BC-10525)
(DE84-015206; DOE/BC-10525/8; AR-2) Avail: NTIS HC A06/MF A01

Polar compounds were isolated from two different shale sources by acid extraction and silica gel adsorption. The identification of the extract components was accomplished by combined gas chromatography - mass spectrometry. Accelerated storage stability tests employing these polar extracts as dopants indicated a range of activities with respect to the promotion of insolubles formation. Extracts comprised of nitrogen bases exhibited moderate activity. The greatest activity was found for highly polar extracts. The autoxidation of 2,5-dimethylpyrrole (DMP) in shale derived diesel fuel was examined by the techniques of X-ray photoelectron spectroscopy, fluorescence phosphorescence, and by monitoring rates of oxygen absorption by stressed fuel. High temperature (100 to 120 (0)C) stress regimes in DMP doped fuel samples displayed different kinetic behavior from that observed at 43 to 80 (0)C, suggesting that mechanistic changes occurred at the higher temperatures. DOE

N85-10213# Los Alamos Scientific Lab., N. Mex.
EUTECTIC EXPLOSIVES CONTAINING AMMONIUM NITRATE Final Report, Oct. 1979 - Sep. 1981
Mary M. Stinecipher Apr. 1984 16 p refs
(Contract W-7405-eng-36)
(DE84-015705; LA-9973-MS) Avail: NTIS HC A02/MF A01

Continued studies of the eutectic explosives of AN show that the most noticeable difference between eutectic systems is the size of the failure diameter. Impact, thermal, and shock sensitivities for eutectic mixtures with various additives are reported. Compatibility of the eutectics with NQ is unusually good as shown by gas evolution on storage at elevated temperatures. Performance was determined with mixtures of AN/ADNT with NQ, Al, or EDD/KN. Also, the performances of two methods of preparing AN/EDD were compared. The irreversible growth of pressed pellets in which

15% of the AN was replaced by KN was measured. The heat of fusion and the heat and products of detonation of AN/ADNT were determined. In addition, the guanidine and ethylenediamine salts of dinitrotriazole were prepared and characterized. DOE

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N85-10214# Joint Publications Research Service, Arlington, Va.
USSR REPORT: MACHINE TOOLS AND METALWORKING EQUIPMENT
30 Oct. 1984 43 p Transl. into ENGLISH from various Russian articles
(JPRS-UMM-84-019) Avail: NTIS HC A03

News items, abstracts, and articles of scientific reports on aspects of machine tools and metal working equipment including industry planning and economics; metal cutting and metal forming machine tools; other metal working equipment; and robotics are contained. For individual titles, see N85-10215 through N85-10217.

N85-10215# Joint Publications Research Service, Arlington, Va.
REPORT ON HIGH-PRECISION JIG-BORING MACHINES c37
L. M. Kordysh *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-84-019) 30 Oct. 1984 p 11-14 Transl. into ENGLISH from Soviet Export (Moscow), v. 150, no. 3, 1984 p 40-41 (For primary document see N85-10214 01-31)
Avail: NTIS HC A03

The Soviet machine tool industry produces a line of jig boring machines with a table width from 250 to 1,400 mm. Geometric form and positional specifications are described. B.G.

N85-10216# Joint Publications Research Service, Arlington, Va.
ELECTRO-SPARK CASE-HARDENING OF CONTOURED SURFACES c26
V. L. Andreyev, V. I. Kerevyenko, and N. I. Beda *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-84-019) 30 Oct. 1984 p 15-17 Transl. into ENGLISH from Mashinostroitel (Moscow), no. 4, Apr. 1984 (For primary document see N85-10214 01-31)
Avail: NTIS HC A03

Electro-spark case hardening of surfaces of parts (austenitic steel 70010) at currents I = 270...300 amperes and voltage V = 32 volts and depositing the VK8 alloy obtains a protective coating 0.3 to 0.45mm thick and forming a mat finish of the macrocontour with evenly distributed microprojections and microdepressions with a roughness of R (sub z) = 180...320 micrometers. This was the basis for electro-spark case hardening of rolls for periodic rolling (weight of roll 2.5 tons, material 40Kh steel with surface hardening to a depth of 2 to 3mm and hardness of HRC 34 to 38) and blooming mill rolls (weight of roll 11 tons, material 50 Kh steel with thermal treatment to HRC 32-36), which are subjected to intensive wear in operation and fail comparatively rapidly. A mechanized, electro-spark technology was developed for case hardening the working surfaces of large size products to increase their service life. Author

N85-10217# Joint Publications Research Service, Arlington, Va.
GROWTH, FUTURE OF SOVIET ROBOTICS SECTOR ANALYZED c37
Viktor Gerasimov and Nikolay Petrov *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-84-019) 30 Oct. 1984 p 20-40 Transl. into ENGLISH from Znamya (Moscow), no. 8, Aug. 1984 p 161-176 (For primary document see N85-10214 01-31)
Avail: NTIS HC A03

Soviet robotics was reviewed and a forecast of future use presented. Special interest was expressed concerning human and social problems caused by the use of robots. B.G.

N85-10218# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
MODELLING THE DEMAND FOR CONSTRUCTION
H. Roland Weistroffer Jul. 1983 21 p refs Submitted for publication
(CSIR-TWISK-322) Avail: NTIS HC A02/MF A01

A system dynamics approach to modelling the demand for construction in South Africa is described. The model presented is intended as a first step in an iterative process of modelling construction demand, and as such is deliberately kept small. Results obtained through the model using historical data indicate that the relations included in the model are indeed relevant. The accuracy of the model is discussed and suggestions for further developing the model are made. R.J.F.

N85-10219# Council for Scientific and Industrial Research, Stellenbosch (South Africa). Electronics and Instrumentation Group.
AUTOMATION OF COASTAL ENGINEERING MODELLING FACILITIES Thesis
J. J. Kuipers Sep. 1983 243 p refs
(CSIR-T/SEA-8304) Avail: NTIS HC A11/MF A01

A model hall automation plan was launched to speed up the time consuming task of collecting data from the model test instrumentation. Instrumentation and control systems to the Model Hall Data Acquisition System (MHDAS) was interfaced. The instruments and control systems were seen as extensions of the MHDAS. The overall model hall automation plan is described. The main objectives are: (1) to update and convert existing first generation microprocessor controlled instrumentation, the probe calibrators, (2) to interface the experimental measurement platform controller (MPC) to the MHDAS, and (3) to add from the design stage all the necessary software and hardware to automate newly developed instrumentation, the trolley controller. E.A.K.

N85-10220*# National Aeronautics and Space Administration, Washington, D. C.
SILICON CARBIDE CERAMIC PRODUCTION
Keiichiro Suzuki and Nobuhiro Shinohara Aug. 1984 12 p Transl. into ENGLISH of Japanese Patent No. 56-189209 (27 Nov. 1981) Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77598; NAS 1.15:77598) Avail: NTIS HC A02/MF A01 CSCL 13H

A method to produce sintered silicon carbide ceramics in which powdery carbonaceous components with a dispersant are mixed with silicon carbide powder, shaped as required with or without drying, and fired in nonoxidation atmosphere is described. Carbon black is used as the carbonaceous component. NASA

N85-10221*# National Aeronautics and Space Administration, Washington, D. C.
INJECTION MOLDING OF SILICON CARBIDE CAPABLE OF BEING SINTERED WITHOUT PRESSURE
A. Muller-Zell and R. Schwarzmeier Sep. 1984 16 p refs Transl. into ENGLISH from Keram. Z. (West Germany), v. 36, no. 10, 1983 p 524-527 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-77736; NAS 1.15:77736) Avail: NTIS HC A02/MF A01 CSCL 13H

The most suitable SiC mass for injection molding of SiC articles (for subsequent pressureless sintering) consisted of beta SiC 84, a wax mixture 8, and polyethylene or polystyrene 8 parts. The most effective method for adding the binders was by dissolving them in a solvent and subsequent evaporation. The sequence of component addition was significant, and all parameters were optimized together rather than individually. E.A.K.

N85-10222# Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Mathematics.
STABLE AND CHAOTIC DYNAMICAL SYSTEMS AND THEIR SINGULARITIES IN THE COMPLEX TIME PLAN Final Report

T. Bountis 1984 10 p refs
(Contract DE-AC02-83ER-13052)
(DE84-011780; DOE/ER-13052/1) Avail: NTIS HC A02/MF A01

Important properties of the motion of dynamical systems were found by analyzing the singularities of their solutions in the complex time plane. The results include: (1) the identification of many, new completely integrable dynamical systems, whose solutions has the Painleve property, i.e., their only singularities are poles; (2) the discovery of many weakly chaotic Hamiltonian systems and partially integrable nonHamiltonian systems whose singularities are poles at leading order with logarithmic terms at higher orders. A numerical study of the relationship between the location of complex time singularities and the onset of large scale chaos as one varies the initial conditions, or some physical parameters of the problem are studied. This indicates that the singularity analysis may become a useful method in the study of the chaotic behavior of higher dimensional systems. DOE

N85-10223# Barber-Nichols Engineering Co., Arvada, Colo.
MODELING OF A SECOND-GENERATION SOLAR-DRIVEN RANKINE AIR CONDITIONER Final Report
M. W. Denius and W. D. Batton Jul. 1984 158 p refs
(Contract DE-AC03-81CS-30576)
(DE84-015132; DOE/CS-30576/T1) Avail: NTIS HC A08/MF A01

Ten configurations of a second-generation, solar-powered, Rankine-driven air conditioner were simulated and the data presented for use in companion studies. The results of the analysis show that the boiling-in-collector (BIC) configuration generates more power per collector area than the other configurations. The models used to simulate the configuration are presented. The generated data are also presented. Experimental work was done to both improve a novel refrigerant and oil lubrication system for the centrifugal compressor and investigate the aerodynamic unloading characteristics of the centrifugal compressor. The information generated was used to define possible turbo-gearbox configurations for use in the second generation computer simulation. DOE

N85-10224# Physikalisch-Technische Bundesanstalt, Brunswick (West Germany). Abteilung Mechanik.
FORCE STANDARD MACHINES OF THE NATIONAL INSTITUTES FOR METROLOGY, VOL. 2
Wolfgang Weiler and Amrital Sawla Jun. 1984 189 p refs
(PTB-Me-62-Vol-2; ISSN-0341-6720) Avail: NTIS HC A09/MF A01

Technical specifications of force standard machines for metrology are given, including deadweight machines (38 machines); lever-type machines (14); hydraulic machines (11) and accumulated force machines (1). The maximum capacity of the deadweight-machines is between 250 and 4,448,200 N; of lever-type machines is between 1.96 N and 2.4 MN; of hydraulic machines is between 600 kN and 16.5 MN. Author (ESA)

N85-10225# National Academy of Sciences - National Research Council, Washington, D. C. Committee on the Machine Tool Industry.
THE US MACHINE TOOL INDUSTRY AND THE DEFENSE INDUSTRIAL BASE
Dec. 1983 130 p
(Contract DAAK21-82-C-0091)
(PB84-216928) Avail: NTIS HC A07/MF A01 CSCL 13I

Important technological and economic trends are shaping the U.S. machine tool industry. New methods of manufacture, and the increasing substitution of new materials for metal, are relegating traditional standalone machine tools to a corner of a larger, factory automation machinery market. New entrants to this market, and the internationalization of machine tool sourcing and sales, have brought severe competitive pressures to bear upon the traditional U.S. machine tool industry. The U.S. machine tool industry and these technological/economic trends are discussed. Some of the factors involved in Federal government procurement that affect the competitive status of the machine tool industry are assessed. Several features of the DOD prime contractor-machine tool builder relationship, inhibit modernization within the U.S. industry. The DOD's interests regarding the U.S. machine tool industry are analyzed and nine recommendations for action by DOD, by agencies with which DOD has frequent contact, and by industry are made. GRA

N85-10226# Grumman Aerospace Corp., Bethpage, N.Y. Advanced Development Dept.
ULTRALIGHTWEIGHT OXYGEN CONTAINER Contract Research Report, 14 Feb. 1980 - 30 Aug. 1983
Ben Aleck Nov. 1983 33 p refs
(PB84-220730; BU-OFR-136-84) Avail: NTIS HC A03/MF A01 CSCL 08I

The replacement of a cylindrical aluminum liner overwrapped with fiberglass filaments and prestressed by yielding the liner under sizing pressure by a higher strength to weight ratio steel liner cryoworked stainless steel overwrapped with a higher strength to weight ratio filament (Kevlar 49) is discussed. The heavyweight ends of the aluminum liner were to be replaced by thin walled domes, which required multiple helix angle wraps for support, instead of the single, kite string wrap from pole to pole of the aluminum overwrapped design when the use of cold swaging of tube ends to form bosses, demonstrated on subscale development efforts, was not achieved full scale a method of making the 4 in. diam. stainless steel liner with a single boss and no welds in a 0.020 in. thick wall from a 0.050 in. thick, 13 in. diam. disk was selected. The demonstration vessel failed by leakage during prestressing because embedded oxides formed flaws in the boss region. Such flaws have been avoided by proper temperature control during hot spinning. Hence, a new design was developed that weighs half as much as its recently developed predecessor. GRA

N85-10227# Texas Transportation Inst., College Station.
PAVEMENT FRICTION MEASUREMENTS ON NONTANGENT SECTIONS OF ROADWAYS, VOL. 1 Final Summary Report, Sep. 1978 - Jun. 1983
Richard A. Zimmer and Richard D. Tonda Washington Federal Highway Administration Oct. 1983 31 p refs
(Contract DOT-FH-11-9481)
(PB84-219732; RF-3871-Vol-1; FHWA/RD-82/149-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 13B

A practical measurement technique for measuring wet-pavement friction for road sections other than the straight, level portions currently measured was developed. Measurements on nontangent sections can be conducted with an ASTM E-274 skid trailer when it accurately measures both the dynamic longitudinal and vertical forces on the test wheel during locked-wheel tests. The limit of performance of an E-274 system is approximately + or - 0.35 g lateral acceleration in the horizontal plane of the test trailer. Nontangent tests should not be attempted unless dynamic vertical forces are determined either by a load cell or translated from accelerations acting on the trailer. GRA

N85-10228# National Bureau of Standards, Washington, D.C. Center for Manufacturing Engineering.
PUBLICATIONS OF CENTER FOR MANUFACTURING ENGINEERING (OF THE NATIONAL BUREAU OF STANDARDS), 1978-1983
Philip Nanzetta and Joan Wellington Mar. 1984 68 p
(PB84-224526; NBSIR-84-2840) Avail: NTIS HC A04/MF A01 CSCL 13H

A list of publications by staff of the Center for Manufacturing Engineering is presented for the period 1978-1983, indexed by subject area. Publications cover research done in the areas of high precision dimensional measurement; sensing and measurement of force, mass, sound, vibration, and surface finish characteristics; and application of advanced controls and sensing techniques to automated machines, manufacturing systems and robot manipulators. GRA

N85-10229# Pennsylvania Transportation Inst., University Park.
PREDICTOR MODEL FOR SEASONAL VARIATIONS IN SKID RESISTANCE, VOLUME 1 Final Summary Report, 25 Aug. 1978 - 31 Aug. 1983
J. J. Henry, K. Saito, and R. Blackburn Washington Federal Highway Administration Apr. 1984 25 p refs
(Contract DOT-FH-11-9474)
(PB84-226612; PTI-8217-Vol-1; FHWA/RD-83/004-Pt-1) Avail: NTIS HC A02/MF A01 CSCL 13B

Two models, utilizing data collected in 1979 and 1980, were developed to predict variations in skid resistance due to rainfall conditions, temperature effects, and time of the year. A generalized predictor model was developed from purely statistical considerations and a mechanistic model was developed from hypothesized mechanisms. This model may be utilized to estimate the skid resistance at any time in the season from a measurement made during the same season, or to adjust skid-resistance measurement made at any time during the season to the end-of-season level. The mechanistic model requires, in addition to the above inputs, two pavement properties describing the polishing characteristics of the aggregate and an estimate of the percent normalized gradient of the skid resistance. The application of these models is summarized. GRA

N85-10230# Pennsylvania Transportation Inst., University Park.
PREDICTOR MODEL FOR SEASONAL VARIATIONS IN SKID RESISTANCE. VOLUME 2: COMPREHENSIVE REPORT Final Report, 25 Aug. 1978 - 31 Aug. 1983
J. J. Henry, K. Saito, and R. Blackburn Washington Federal Highway Administration Apr. 1984 125 p refs
(Contract DOT-FH-11-9474)
(PB84-226620; PTI-8217-Vol-2; FHWA/RD-83/005-Vol-2) Avail: NTIS HC A06/MF A01 CSCL 13B

Two models, utilizing data collected in 1979 and 1980, were developed to predict variations in skid resistance due to rainfall conditions, temperature effects, and time of the year. A generalized predictor model was developed from purely statistical considerations and a mechanistic model was developed from hypothesized mechanisms. This model may be utilized to estimate the skid resistance at any time in the season from a measurement made during the same season, or to adjust skid-resistance measurement made at any time during the season to the end-of-season level. GRA

N85-10231# Mississippi State Highway Dept., Jackson. Research and Development Div.
A STUDY OF BITUMINOUS PAVEMENTS TO DETERMINE A CORRELATION BETWEEN PAVEMENT STRUCTURE DESIGNS AND TRIPPING OF ASPHALT CEMENT Final Report
Billie R. Barton Mar. 1984 155 p
(PB84-217751; MSHD-RD-84-080) Avail: NTIS HC A08/MF A01 CSCL 13B

After detecting a few cases of stripping of asphalt cement from the aggregate in bituminous pavement, there was concern that stripping might be a widespread problem in the state. It is agreed that water is the cause of stripping, and it was the opinion of some that pavements on granular bases would be less likely to strip because of supposedly better drainage characteristics. Differently designed pavement structures in all areas of the state were investigated to determine if there is a correlation between base and pavement design and stripping. Stripping was not as widespread as had been feared and there was less stripping in fulldepth bituminous base and pavement constructed over a lime-treated subgrade than in pavements constructed oer granular bases. This was contrary to what some had theorized. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N85-10232*# National Aeronautics and Space Administration, Washington, D. C.
WAVE MULTIPLE SCATTERING BY A FINITE NUMBER OF UNCLOSED CIRCULAR CYLINDERS
E. I. Veliyev and V. V. Veremey Aug. 1984 35 p refs Transl. into ENGLISH of "Difraktsiya voln na konechnom chisle nezamknutykh tsilindricheskikh ekranov" rept. Pr-163 Kharkov, 1980 41 p Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Inst. of Radiophysics and Electronics, Academy of Sciences of the Ukrainian SSR, Kharkov
(Contract NASw-3541)
(NASA-TM-77593; NAS 1.15:77593; Pr-163) Avail: NTIS HC A03/MF A01 CSCL 20N

The boundary value problem of plane H-polarized electromagnetic wave multiple scattering by a finite number of uncloed circular cylinders is solved. The solution is obtained by two different methods: the method of successive scattering and the method of partial matrix inversion for simultaneous dual equations. The advantages of the successive scattering method are shown. Computer calculations of the suface currents and the total cross section are presented for the structure of two screens. Author

N85-10233*# National Aeronautics and Space Administration, Washington, D. C.
WAVE GUIDE BRANCHINGS (n-PORT) TYPES OF REPRESENTATION OF LINEAR, TIME-INDEPENDENT AND SOURCELESS n-PORTS
Hans Brand Jan. 1982 26 p Transl. into ENGLISH from the book "Schaltungslehre Linearer Mikrowellennetze" Stuttgart, S. Hirzel Verlag, 1970 p 118-137 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-77770; NAS 1.15:77770) Avail: NTIS HC A03/MF A01 CSCL 20N

The wave representation and scattering matrix of n-ports is discussed. This representation is particularly suited to the treatment of microwave switching. B.G.

N85-10234*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CASE STUDY OF SAMPLE SPACING IN PLANAR NEAR-FIELD MEASUREMENT OF HIGH GAIN ANTENNAS
Roberto J. Acosta and Richard Q. Lee Washington 1984 10 p refs Presented at the Antenna Appl. Symp., Montecello, Ill., 18-21 Sep. 1984; sponsored by Illinois Univ.
(NASA-TM-86872; E-2301; NAS 1.15:86872) Avail: NTIS HC A02/MF A01 CSCL 20N

Far field antenna patterns can be reconstructed from planar near field measurements acquired at a sample spacing of lambda/2 or less. For electrically large antennas, sampling at the Nyquist rate may result in errors due to system electronic drift over long acquisition times. The computer capacity may limit the largest size of the near field data set. The requirement to sample at the Nyquist rate is relaxed for high gain antennas which concentrate most of the radiated energy into a small angular region of the far field. The criteria for sample spacing at greater than lambda/e through the use of a priori information of the antenna radiation characteristics are presented. Far field patterns of a 30 GHz dual offset reflector system with a 2.7 m parabolic main reflector are computed from near field data obtained at sample spacings ranging from 0.1 lambda to 10 lambda. The effects of sampling interval and spectrum cutoff on the far field patterns are discussed. E.A.K.

N85-10235# Naval Postgraduate School, Monterey, Calif.
A REVIEW OF SELECTED STUDIES OF COMPUTERIZED

SPEECH RECOGNITION CONDUCTED AT THE NAVAL POSTGRADUATE SCHOOL Technical Report
D. E. Nell Nov. 1983 55 p
(AD-A144841; NPS55-83-033) Avail: NTIS HC A04/MF A01 CSCL 17/2

This report reviews selected voice recognition experiments conducted at NPS (Naval Postgraduate School). It includes a brief description of selected experiments and the findings. Suggestions for expansion of areas of research and areas in which NPS has not pursued research are indicated. GRA

N85-10236# Battelle Memorial Inst., Columbus, Ohio.
FACSIMILE TRANSMISSION OF MICROFORMS Final Report
W. Saffady 30 Dec. 1983 101 p
(Contract DAAG29-81-D-0100)
(AD-A144855; AD-F000047) Avail: NTIS HC A06/MF A01 CSCL 17/2

Libraries and technical information centers are storing increasingly large amounts of information in microform. In the process, they have generated a tremendous problem in delivering documents to the end user. When needed research documents are available in microform, no rapid transmission of the information contained in them is possible. Mailing microforms is too slow a method to meet information needs of today's researcher. Some form of telefacsimile transmission of microform is needed. This study is designed to describe the current status of the technology, and to recommend directions for future research and development. GRA

N85-10237# Naval Research Lab., Washington, D. C.
IMPROVEMENT OF THE NARROWBAND LINEAR PREDICTIVE CODER. PART 2: SYNTHESIS IMPROVEMENTS Final Report
G. S. Kang and S. E. Everett 11 Jun. 1984 45 p
(AD-A145031; AD-E000588; NRL-8799) Avail: NTIS HC A03/MF A01 CSCL 17/2

The narrowband linear predictive coder (LPC) is widely used in both civilian and military applications. Yet in spite of improvements over the years, it is still not universally accepted by general users. This report examines the weakness of the LPC synthesizer, particularly the excitation signal. Diagnostic Acceptability Measure tests show an increase up to five points. This can be achieved without altering the speech sampling rate, the frame rate, or the parameter coding. GRA

N85-10238# Naval Research Lab., Washington, D. C.
RESISTANCE TO HF JAMMING INTERFERENCE IN MOBILE RADIO NETWORKS BY AN ADAPTIVE, DISTRIBUTED RECONFIGURATION TECHNIQUE Interim Report, 1 Oct. 1982 - 31 Jan. 1984
D. J. Baker, J. E. Wieselthier, A. Ephremides, and D. N. McGregor 9 Aug. 1984 24 p
(AD-A145117; NRL-8834) Avail: NTIS HC A02/MF A01 CSCL 17/4

In radio communication, interference (and in particular jamming) represents an important limitation to the rate and range of information transfer. In a radio network environment, a combination of relaying and other classes of interference-combatting methods, such as spread spectrum signaling, may achieve highly robust resistance to jamming. Since the presence of relays is an inherent characteristic of a network, it is possible to use some nodes as relays when previously existing direct links are disabled as a result of jamming. The purpose of this report is to show how a distributed algorithm can enable an HF radio network to reconfigure itself to combat various jamming threats. We present models for the communication range that is achievable through the use of HF groundwave signals under both benign and stressed conditions and for cases of narrowband and wideband signaling. The models are used in our simulations. These simulations show that the choice of best frequency for communication in an HF network should not depend solely on communication range in a benign environment. Author (GRA)

N85-10239# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
NEW TYPE OF UNIQUE FREQUENCY LASER COMMUNICATIONS
Z. R. Sun 10 Aug. 1984 5 p Transl. into ENGLISH from Dianxin Jishu (China), no. 116, Nov. 1983 p 45
(AD-A145128; FTD-ID(RS)T-0859-84) Avail: NTIS HC A02/MF A01 CSCL 17/2

Optical fiber communications were developed. The single mode optical fiber was invented to transmit light beams with a unique frequency. The present existing multimode optical fiber which is used to transmit light beams with several frequencies may be replaced by such a single mode optical fiber. The development of a controllable solid state laser which can produce super pure unique frequency light beams is described. E.A.K.

N85-10240# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PROBLEMS ON THE DIFFRACTION AND PROPAGATION OF WAVES (SELECTED ARTICLES)
G. I. Makarov, V. V. Novikov, and N. P. Tikhomirov 9 Aug. 1984 119 p Transl. into ENGLISH from Problemy Difraktsii i Rasprostraneniya Voln (USSR), no. 11, 1972 p 3-32, 33-56, 201-204
(AD-A145139; FTD-ID(RS)T-1001-84) Copyright. Avail: NTIS HC A06/MF A01 CSCL 20/14

The behavior of the eigenvalues of the transverse operator of the problem of the propagation of electromagnetic waves in the flat/plane and spherical waveguide channels was investigated. It is assumed that the lower wall of waveguide is ideally conducting, and on the upper wall impedance type approximate boundary conditions are used. The changes in the behavior of eigenvalues in the use of strict boundary conditions on the upper waveguide are outlined. The flat/plane waveguide is examined. E.A.K.

N85-10241# LuTech, Inc., Hayward, Calif.
PLANARITY CRITERIA IN ELECTROMAGNETIC TOPOLOGY Final Report, Oct. 1982 - Oct. 1983
R. S. Noss Wright-Patterson AFB, Ohio AFWL Jul. 1984 42 p Prepared for Dikewood Corp., Albuquerque, N. Mex.
(Contract F29601-82-C-0027; AF Proj. 3763)
(AD-A145279; AFWAL-TR-84-20) Avail: NTIS HC A03/MF A01 CSCL 12/1

The principal tool of the electromagnetic topologist is the interaction sequence diagram (ISD), which is the dual graph of the electromagnetic topology (EMT) of a system. One of the problems of working with the ISD is its complex appearance, in part due to multiple crossings of edges. This report presents some necessary and sufficient conditions for a graph to be planar, plus an algorithm to determine the planarity of any graph from its incidence matrix. Several topological invariants of the ISD are defined to aid the discussion of computational feasibility of the algorithm. Author (GRA)

N85-10242# Department of the Air Force, Washington, D.C.
NOISE JAMMER DISCRIMINATION BY NOISE SPECTRAL BANDWIDTH Patent Application
C. D. Wise, inventor (to Air Force) Filed 7 Jun. 1984 14 p
(AD-D011224; US-Patent-Appl-SN-618268) Avail: NTIS HC A02/MF A01 CSCL 17/4

A method for distinguishing between multiple noise jammer sources having different noise spectral bandwidths is presented. Noise signals are detected over a relatively narrow detection bandwidth. The percent of time that the jammer spectral noise is within the fixed detection bandwidth is used to estimate the jammer spectral bandwidth. Author (GRA)

N85-10243# Department of the Air Force, Washington, D.C.
FAST ENVELOPE DETECTOR WITH BIAS COMPENSATION Patent Application
S. M. Bryant, inventor (to Air Force) Filed 22 Jun. 1984 17 p
(AD-D011226; US-Patent-Appl-SN-623581) Avail: NTIS HC A02/MF A01 CSCL 17/9

In combination with an enveloped detector in a radar system,

a bias compensation circuit consisting of a programmable read-only memory and a binary adder produce an unbiased envelope detection signal. The bias compensation circuit adds one to the output of the detector based upon whether the minimum of the I and Q (inphase and quadrature) signals is odd and the maximum even. It is capable of compensating for both normal envelope detection and the multiple divide-by-two-case. As a result the dynamic range of the radar can be increased without the necessity for extensive additional hardware. Author (GRA)

N85-10244# Department of the Air Force, Washington, D.C.
REFLECTOR ANTENNA HAVING SIDELOBE SUPPRESSION ELEMENTS Patent Application
D. Jacavanco, inventor (to Air Force) Filed 25 Jun. 1984 21 p
(AD-D011227; US-Patent-Appl-SN-623905) Avail: NTIS HC A02/MF A01 CSCL 09/5

The present invention relates to electromagnetic wave reception and transmission apparatus and more particularly, to a reflector type antenna having elements disposed on the reflective surface thereof for suppressing unwanted sidelobes in the original antenna pattern. Various techniques have been used in the past for nulling or suppressing selected sidelobes in directional antenna systems. One such technique is adaptive nulling, particularly suitable for phased array systems, where a null is electronically placed in the antenna response pattern to reduce the amount of energy received from a jamming signal source. Adaptive nulling, however, requires costly components, complex algorithms, often requires long signal processing times, and is not suitable for reflector type antennas. GRA

N85-10245# Department of the Air Force, Washington, D.C.
CLUTTER GENERATOR FOR USE IN RADAR EVALUATION Patent Application
G. A. Lawrence, inventor (to Air Force) Filed 26 Jun. 1984 26 p
(AD-D011234; US-Patent-Appl-SN-624846) Avail: NTIS HC A03/MF A01 CSCL 17/9

The testing of radar systems is enhanced with the use of clutter generator that simulates realistic terrain echo returns which are provided in real-time. A fast array processor is used in combination with a Fourier Transform processor to produce a complex digital output having time, frequency and magnitude information corresponding to the composite echos from thousands of points. A digital-to-analog converter filters the output and a single-sideband mixer converts the digital output to a radio frequency signal. Author (GRA)

N85-10246# Department of the Air Force, Washington, D.C.
TURNAROUND CONTROL FOR MECHANICALLY SCANNED RADAR ANTENNAS Patent Application
R. J. Bennett, inventor (to Air Force) Filed 20 Jun. 1984 23 p
(AD-D011238; US-Patent-Appl-SN-622614) Avail: NTIS HC A02/MF A01 CSCL 17/9

A programmed turnaround generator for a mechanically scanned antenna, to provide an n-bar scan pattern (n may be 1), with predetermined inputs to the generator comprising a desired turnaround time, a maximum excursion of the antenna in azimuth, and a start position for each bar, is mechanized using closed form equations. GRA

N85-10247# Department of Energy, Washington, D. C.
PARABOLIC TAPERS FOR OVERMODED WAVEGUIDES Patent Application
John L. Doane, inventors (to DOE) Filed 25 Nov. 1983 15 p
(Contract DE-AC02-76CH-03073)
(DE84-014237; US-Patent-Appl-SN-554868) Avail: NTIS HC A02/MF A01

A waveguide taper with a parabolic profile, in which the distance along the taper axis varies as the square of the tapered dimension was examined provides less mode conversion than equal length linear tapers and is easier to fabricate than other nonlinear tapers. DOE

N85-10248# Fondazione Ugo Bordoni, Rome (Italy).
CLASSIFICATION METHODS FOR ITALIAN VOWELS [METODI DI CLASSIFICAZIONE DELLE VOCALI ITALIANE]
Antonio Federico (Comitato Nazionale per l'Energia Nucleare) Dec. 1982 22 p refs In ITALIAN
(FUB-61-1982) Avail: NTIS HC A02/MF A01

The automatic recognition of vowel sounds in voice signals is discussed. At a 10 to 12 kHz sampling rate for orthophonic signals, data are extracted using a 256 bit Hamming window. Two analysis methods are considered. The fast Fourier transform followed by cepstral analysis, and linear prediction which defines the signal as an autoregressive process of n order. The choice of parameters include the energy associated to spectrum bands, the first cepstral coefficients, the first four formant frequencies and the linear prediction coefficients or its derivatives. The stability problem and the elimination of multivowel sounds is analyzed. Author (ESA)

N85-10249# Fondazione Ugo Bordoni, Rome (Italy).
INTERACTION OF VOICE AND DATA TRAFFIC IN A PACKET SWITCHING COMMUNICATION NETWORK AND VIRTUAL CIRCUIT [INTERAZIONE DI TRAFFICO VOCALE E DI TRAFFICO DATI CONVERSAZIONALE IN UNA RETE A COMMUTAZIONE DI PACCHETTO E CIRCUITO VIRTUALE]
Davide Grillo and Germano Tartaruga Oct. 1982 46 p refs In ITALIAN
(FUB-63-1982) Avail: NTIS HC A03/MF A01

The performance of a mixed voice and data network with virtual circuit routing is examined. For the data signals a time lag is admitted but no loss is tolerated in the connection attempts. For the voice signals no time lag is admitted while a small loss in the attempts to establish a connection is accepted. The results show that the evaluation indexes depend on traffic condition and network element parameters. In overload conditions the increased reject of voice calls favors the data traffic. Author (ESA)

N85-10250# Fondazione Ugo Bordoni, Rome (Italy).
DESCRIPTION OF A SEMIANNUAL SELECTION PROCEDURE OF VOWEL PARTS OF THE VOICE SIGNAL USING A PDP 11/34 COMPUTER [DESCRIZIONE DI UNA PROCEDURA DI SELEZIONE SEMIAUTOMATICA DEI TRATTI VOCALICI DEL SEGNALE FONICO MEDIANTE ELABORATORE PDP 11/34]
Simona Scotti Jan. 1983 16 p refs In ITALIAN
(FUB-4-1983) Avail: NTIS HC A02/MF A01

Statistical variations of linear prediction parameters of vowel segments were studied in phonic experiments. The computer program written in FORTRAN is described. The signal audiovisual scanning procedure may be used by untrained operators. The data processing requires 5 min/vowel. Author (ESA)

N85-10251# Fondazione Ugo Bordoni, Rome (Italy).
DETECTION AND CODING TECHNIQUES OF CONTOURS IN IMAGE SIGNALS [ALCUNE TECHNICHE DI RIVELAZIONE E CODIFICAZIONE DEI CONTORNI NEI SEGNALI D'IMMAGINE]
Roberto Cusani Jul. 1983 55 p refs In ITALIAN
(FUB-8-1983) Avail: NTIS HC A04/MF A01

Image contour edge enhancement, edge detection, edge recognition, edge linking, image restoration, image enhancement, image coding, and image analysis are reviewed. Representation of complete contours based on parametric data, and implicit representation of complete contours are discussed. Author (ESA)

N85-10252# Fondazione Ugo Bordoni, Rome (Italy).
TENDENCIES IN THE DEVELOPMENT OF UTILIZATION PROTOCOLS, SEMINAR REPORT [RELAZIONE SUL SEMINARIO: ATTUALI TENDENZE SULLO SVILUPPO DEI PROTOCOLLI DI UTILIZZAZIONE]
Aldo Roveri (Rome Univ.) Jul. 1983 11 p ref In ITALIAN
(FUB-11-1983) Avail: NTIS HC A02/MF A01

The open system interconnections model (OSI) structured approach to specify protocols is discussed. A stratification in seven levels characterizes the architecture of the system. Transfer level protocol characterization of utilization protocols in the OSI model,

data flow control, and presentation and application levels are described. Author (ESA)

N85-10253# Fondazione Ugo Bordoni, Rome (Italy).
DETERMINATION OF VOWEL ZONES IN SPEECH [DETERMINAZIONE DELLE ZONE VOCALIQUE NEL PARLATO]
Maria Gabriella DiBenedetto and Armando Lanaro Sep. 1983 22 p refs In ITALIAN
(FUB-16-1983) Avail: NTIS HC A02/MF A01

An automatic, vowel determination method using a set of parameters which are functions of the frequency distribution of the signal energy is presented. The classification algorithm makes sequential decisions based on comparison with threshold values obtained experimentally. The voice signal filtered at 4.4 kHz is sampled at 10 kHz and quantized at 12 bits per sample. The experimental results assure 95% recognition of the vowel sounds. Author (ESA)

N85-10254# Fondazione Ugo Bordoni, Rome (Italy).
INTERFERENCE EXPERIMENT WITH THE SIRIO-OTS SATELLITES [ESPERIMENTO DI INTERFERENZA SIRIO-OTS]
Paolo Lombardi, Piergiorgio Migliorini, and Enrico Saggese (Telespazio S.p.A.) Jun. 1983 24 p In ITALIAN
(FUB-17-1983) Avail: NTIS HC A02/MF A01

During an orbit transfer of the Sirio satellite an interference experiment with the OTS satellite carried was performed. Both satellites may transmit in the 11.6 GHz band. A BPSK signal was transmitted to the satellites and received by stations with programmed tracking systems. Receiving stations registered the signal power intensity and the bit errors in 1 sec time samples. The satellites do not interfere if their angular distance is larger than twice the beam aperture of the receiving antenna. Author (ESA)

N85-10255# Fondazione Ugo Bordoni, Rome (Italy).
BROADBAND LOCAL DISTRIBUTION NETWORKS: PROBLEMS AND PROSPECTS IN ITALY
Umberto DeJulio (Societa' Italiana per l'Esercizio Telefonico), Roberto Scarinci (Ist. Superiore delle Poste e Delle Telecomunicazioni), and Francesco Villani Sep. 1983 19 p refs In ITALIAN; ENGLISH summary Presented at 22nd Giornate Europee delle Telecomun. Madrid, 19-24 Sep. 1983
(FUB-18-1983) Avail: NTIS HC A02/MF A01

Technical and institutional problems, possible architectures and switching or transmission aspects of broadband communication networks are surveyed. Service and network exploitation policies in Europe are examined. Author (ESA)

N85-10256# Fondazione Ugo Bordoni, Rome (Italy).
IMAGE SIGNALS ENCODING TECHNIQUES ORIENTED TOWARDS THE REDUCTION OF PERCEPTIVE REDUNDANCE [ALCUNE TECHNICHE DI CODIFICAZIONE DEI SEGNALI DI IMMAGINE ORIENTATE VERSO LA RIDUZIONE DI RIDONDANZA PERCETTIVA]
Roberto Cusani Sep. 1983 32 p refs In ITALIAN
(FUB-23-1983) Avail: NTIS HC A03/MF A01

Image signal encoding techniques are reviewed. The reduction of perceptive redundance allows a further diminution of the image signal transmission rate. Compression efficiency and image quality are compared. Contour texture analysis and contour coding are the most effective to improve compression rate without a quality loss. Author (ESA)

N85-10257# Fondazione Ugo Bordoni, Rome (Italy).
VOWEL PHONEME IDENTIFICATION IN SPEECH [INDIVIDUAZIONE DEI FONEMI VOCALICI NEL PARLATO]
Maria Gabriella DiBenedetto and Armando Lanaro Sep. 1983 5 p In ITALIAN Presented at AIA-83 Conv., Turin, 19-21 Sep. 1983
(FUB-26-1983) Avail: NTIS HC A02/MF A01

Parameters correlated to the frequency distribution of voice signal energy were used to investigate the efficiency of a vowel phoneme identification method using a limited band of preestablished frequencies. The classification algorithm works in sequenced decisions based on the comparison of the parameter values with experimentally determined thresholds. A PDP 11/34 was used with voice signals filtered at 4.4 kHz sampled at 10 kHz and quantized at 12 bit. Sample segment duration was 25.6 msec. Results show a recognition ability of 95% of the vowel sounds and 90% recognition of the signal segments in the signal stability region, while at the limit of the stability zone the segment recognition drops to 86%. Author (ESA)

N85-10258# Fondazione Ugo Bordoni, Rome (Italy).
THE AVERAGE POWER DENSITY SPECTRA OF ADDITIVE SCRAMBLER SIGNALS AND THEIR VERSIONS IN AMI CODE [SPETTRO MEDIO DI DENSITA DI POTENZA DI SEGNALI EMESSI DA SCRAMBLER ADDITIVI E DELLE CORRISPONDENTI VERSIONI IN CODICE AMI]
Odoardo Brugia, Giovanni Campanini, and William Wolfowicz Jul. 1983 21 p refs In ITALIAN
(FUB-27-1983) Avail: NTIS HC A02/MF A01

The scrambler outlet spectra, the AMI coding outlet spectra and their variations as a function of the scrambler inlet signal symbol statistics are studied for repeater design in a 565 Mb/sec coaxial cable data system. Expressions for the autocorrelation and the average power density spectra are obtained assuming that the characteristic polynomial of the scrambler is primitive and that the source is stationary and ergodic. It is shown that distortion produced by the discrete components results in jitter by amplitude to phase conversion. At the output of the AMI coder, when the probability of the zero symbols approachs one, the performance of the additive scrambler introduces an overload of the automatic gain control of the equalizing amplifier. Author (ESA)

N85-10259# Fondazione Ugo Bordoni, Rome (Italy).
VOICE PHONETIC CODING AND DECODING PROCESSES [RESOCONTO DEL SIMPOSIO SU PROCESSI DI CODIFICA FONETICA E DECODIFICA DELLA VOCE TENUTOSI A TOLOSA IL 15-16 LUGLIO 1983]
Lucio PrinaRicotti and Paolo Pocci Sep. 1983 18 p refs In ITALIAN Symp. held at Tolosa, Italy, 15-16 Jul. 1983
(FUB-29-1983) Avail: NTIS HC A02/MF A01

The search for cues (acoustic and articulatory analysis), perceptual cue validation (perception) and cue identification (speech recognition) were discussed. Author (ESA)

N85-10260# Fondazione Ugo Bordoni, Rome (Italy).
VOICE COMMUNICATION HANDLING IN X 25 PACKET SWITCHING NETWORKS
Marco Listanti and Francesco Villani Sep. 1983 8 p refs
(FUB-30-1983) Avail: NTIS HC A02/MF A01

A voice protocol conceived an a subset of the whole X 25/75 procedure is described. Error and flow control are missing or modified and additional information for voice reassembly and processing is included. The protocol exploits user-to-user procedures for voice reassembly and flow control and is oriented toward speeding up voice processing by network equipment. Evaluation shows that such a protocol can handle voice communication in packet switched networks and that the integration of voice and data is worth further investigation. Author (ESA)

N85-10261# Fondazione Ugo Bordoni, Rome (Italy).
AVAILABILITY OF TRANSMISSION SYSTEMS IN CONTINENTAL AND INTERCONTINENTAL CONNECTIONS [DISPONIBILITA DEI SISTEMI DI TRASMISSIONE NELLE CONNESSIONI CONTINENTALI ED INTERCONTINENTALI]
Francesco Avanzi (Ist. Superiore delle Poste e delle Telecomunicazioni), Gastone Bonaventura (Azienda di Stato per i Servizi Telefonici), Rocco Gentile (Azienda di Stato per i Servizi Telefonici), and Ugo Mocci Feb. 1983 12 p refs In ITALIAN
(FUB-33-1983) Avail: NTIS HC A02/MF A01

The relationship between service availability and network availability are considered with respect to two types of end to end reference connections usable for international networks. Numerical computations were made by a weighted availability index to verify the acceptability of availability targets specified for

particular transmission media. The evaluations show that the service interruptions are one order of magnitude smaller then the objectives recommended for radio links. Author (ESA)

N85-10262# Fondazione Ugo Bordoni, Rome (Italy).
RESERVE AND AUTHENTICATION IN INTEGRATED SERVICES DISTRIBUTED NETWORKS (ISDN) NETWORKS [RISERVATEZZA E AUTENTICAZIONE NELLA RETE ISDN]
Salvatore Improta Dec. 1983 30 p refs In ITALIAN
(FUB-37-1983) Avail: NTIS HC A03/MF A01

Security problems in integrated services distributed networks are discussed. A multiuser cryptographic technique in which each user is assigned a single secret code known only by the high security distribution service and the user himself is outlined. A protocol which implements code distribution is described. Author (ESA)

N85-10263# Fondazione Ugo Bordoni, Rome (Italy).
METHODS FOR THE DESIGN OF QUANTIZERS FOR IMAGE SIGNALS [ALCUNI METODI PER IL PROGETTO DI QUANTIZZATORI PER SIGNALI D'IMMAGINE]
Filomena Papa Dec. 1983 26 p refs In ITALIAN
(FUB-38-1983) Avail: NTIS HC A03/MF A01

Design methods based on statistical and subjective methods for application to PCM and DPCM transmission are reviewed. The analysis shows that the best choice is to design the quantizer to minimize output signal entropy while maintaining a low distortion level. The image quality levels are given in the perception space after identifying appropriate metrics and functions. Author (ESA)

N85-10264# Fondazione Ugo Bordoni, Rome (Italy).
COMPARATIVE ANALYSIS OF THE CLUSTERING OF THE LPC COEFFICIENTS IN PHONEME RECOGNITION [STUDIO COMPARATIVO MEDIANTE ANALISI DEGLI AGGRUPPAMENTI DEI COEFFICIENTI DI RAPPRESENTAZIONE LPC PER IL RICONOSCIMENTO DEI FONEMI]
Lucio Prinaricotti and Paolo Pocci Dec. 1983 27 p refs In ITALIAN
(FUB-39-1983) Avail: NTIS HC A03/MF A01

Coefficient vectors are taken as points of a n-dimensional space to obtain indications on voice data structure by clustering analysis techniques. The automatic clustering methods include iterative minimax, unsupervised radial clustering and shared near neighbors. The initial experimental data were 25 names spoken by 5 speakers. An autocorrelation algorithm with exponential window was used. The recursive and reflexion coefficient vectors were obtained with the help of the Levinson algorithm. The impossibility of multispeaker vowel recognition without a previous speaker normalization, based on the studied methods, is accepted. Author (ESA)

N85-10265# Fondazione Ugo Bordoni, Rome (Italy).
GAUSSIAN WIDE SENSE STATIONARY UNCORRELATED SCATTERING (GWSSUS) CHANNEL SIMULATION PROGRAM TO BE USED FOR MOBILE RADIO SYSTEMS [PROGRAMMA DI SIMULAZIONE DI UN CANALE GWSSUS UTILIZZABILE NEI SISTEMI RADIOMOBILE]
Gabriele Falciasecca (Bologna Univ.) and Guido Riva Dec. 1983 104 p refs In ITALIAN
(FUB-40-1983) Avail: NTIS HC A06/MF A01

The analysis of transmission channels characterized by fast time variations due to the mobility of one of the stations is developed via a Gaussian wide sense stationary uncorrelated scattering model. A program to simulate the model for applications to mobile radio systems is described. The program is useful in the analysis of the attenuation statistics and waveforms in the presence of pulse modulation. Author (ESA)

N85-10266# Fondazione Ugo Bordoni, Rome (Italy).
AUTOREGRESSIVE NONSTEADY METHODS FOR THE ANALYSIS AND SYNTHESIS OF THE HUMAN VOICE [METODI AUTOREGRESSIVI NON STAZIONARI PER L'ANALISI E LA SINTESA DELLA VOCE]
Lucio PrinaRicotti May 1984 25 p refs In ITALIAN
(FUB-3-1984) Avail: NTIS HC A02/MF A01

The autoregressive steady model and its extension to the nonsteady case are described. Starting from Grenier's Theorem it is shown that a generalization of the previous model may describe a nonstationary stochastic process. The hypothesis for the implementation of the nonsteady filter is that the model coefficients could be estimated as weighted linear combinations of a small number of known functions. A Levinson algorithm capable of solving the matrix problem is presented. Sampling interval can be extended to 100 msec. Author (ESA)

N85-10267# Fondazione Ugo Bordoni, Rome (Italy).
MEASURES OF DISTANCE BETWEEN SPEECH SIGNALS IN THE FREQUENCY DOMAIN [MISURE DI DISTANZA TRA SEGNALI VOCALI NEL DOMINO DELLA FREQUENZA]
Domenico DeSeta Feb. 1984 31 p refs In ITALIAN
(FUB-5-1984) Avail: NTIS HC A03/MF A01

The energy density spectra and the time behavior of the autoregressive model of voice signals are studied. The first is a complete representation of the voice signal in the frequency domain, derived from the application of the Fourier transform to the sampled signal. The second is based on a voice signal generation model in which the channel is represented by poles only (resonances). A symmetrical version of the Itakura distance is the best compromise between conflicting requirements. Author (ESA)

N85-10268# National Telecommunications and Information Administration, Annapolis, Md.
PLANNING GUIDE FOR THE REVIEW OF TELECOMMUNICATIONS SYSTEMS FOR FREQUENCY AVAILABILITY AND ELECTROMAGNETIC COMPATIBILITY
Robert T. Watson Jan. 1984 65 p refs
(PB84-210238; NTIA/REPORT-84-141) Avail: NTIS HC A04/MF A01 CSCL 17B

Guidance to Federal system planners in security spectrum support for proposed new or modified telecommunications systems in compliance with procedures of the National Telecommunications and Information Administration (NTIA) is provided. These procedures are in response to an Office of Management and Budget Circular (OMB Circular No. A-11) requiring certification from NTIA of spectrum support prior to submission of budget estimates to OMB. The various steps involved in the process are summarized, along with suggested questions each agency should address in preparation for submission and provides example outputs. GRA

N85-10269# National Weather Service, Fort Worth, Tex. Scientific Services Div.
OPERATIONAL EVALUATION OF 5 cm DOPPLER RADAR. TWO CONTRIBUTIONS: REVIEW OF WSR-74C DOPPLER RADAR OPERATIONS AT WSO MONTGOMERY, ALABAMA (APRIL 1982 - AUGUST 1983). THE JOHNSON-EFFECT RESOLVING AMBIGUOUS DOPPLER VELOCITIES
Paul E. Pettit and William N. Johnson May 1984 28 p refs
(PB84-207521; NOAA-TM-NWS-SR-110; NOAA-84061406) Avail: NTIS HC A03/MF A01 CSCL 17I

The National Weather Service (NWS) office in Montgomery, Alabama has been interested in new radar technology for several years and a working relationship with Enterprise Electronics Corp. (EEC) has provided their office with a look at some of the newer advances in meteorological radar equipment. In April, 1982, a request was made by Enterprise Electronics Corp. to the NWS for permission to install a Doppler add-on package to the WSR-74C (5cm) located at Montgomery, Alabama. The installation was to be on a loan basis with no designated termination data. It must be made clear that the prototype add-on equipment was by no means the ultimate in Doppler radar. However, later advances led to a more advanced system which was installed at Montgomery in July of 1983. Author (GRA)

N85-10270# National Oceanic and Atmospheric Administration, Boulder, Colo. Space Environment Lab.

HIGH FREQUENCY RADAR SOFTWARE REFERENCE MANUAL FOR PRODUCT TWO
David C. Walden, ed., James R. Winkelman, Lorne D. Matheson, and Richard N. Grubb Mar. 1984 490 p
(PB84-210079; NOAA-TM-ERL-SEL-68; NOAA-84061405) Avail: NTIS HC A21/MF A01 CSCL 17I

The Space Environment Laboratory (SEL) of NOAA developed a general purpose High Frequency (HF) Radar system capable of making most of the measurements of the ionosphere that can be made by coherent monostatic or bistatic radio wave sounding. This capability is provided by combining a very flexible, frequency-agile transmitter and receiver system with a digital control and signal processing system containing a general purpose 16-bit minicomputer for operator interaction and control. A manual is given which describes the software operating system written by the SEL staff to permit the Radar to be used for quite a wide range of standard measurements under simple operator control. The control language enables the user to exploit most of the capabilities of the instrument without having to program the system in detail. The manual is primarily directed at the user who needs to understand and use this capability. Secondarily, if used in conjunction with the computer manufacturer's system and language manuals, the SEL HF Radar Hardware manuals and the SEL source code listings, it should enable an experienced user to customize the software for special purposes or to produce new operating software. Author (GRA)

N85-10271# National Telecommunications and Information Administration, Boulder, Colo. Inst. for Telecommunication Sciencee.
ATMOSPHERIC CHANNEL PERFORMANCE MEASUREMENTS AT 10 TO 100 GHz
R. H. Espeland, E. J. Violette, and K. C. Allen Apr. 1984 122 p refs
(PB84-211325; NTIA/REPORT-84-149) Avail: NTIS HC A06/MF A01 CSCL 20N

A diagnostic probe designed to investigate propagation at millimeter wavelengths was operated on 11.8 and 27.2-km line-of-sight paths near Boulder, CO. Fully coherent carrier wave channels at 11.4, 28.8, and 96.1 GHz provide data to analyze fade mechanisms and evaluate frequency dependent performance characteristics of the link. Data during fog, snow, rain, and clear-air fade events are included with statistical analyses of event occurrence, signal levels, and bit error rates. Time delay distortion and amplitude dispersion on the channel are also examined during fading events by the wide-band digital channel operated as an impulse probe. Rain attenuation, path absorption due to water vapor content, and seasonal variations as a function of frequency are presented and described. GRA

N85-10272# National Bureau of Standards, Boulder, Colo. Electromagnetic Fields Div.
A COAXIAL NOISE STANDARD FOR THE 1 GHz TO 12.4 GHz FREQUENCY RANGE Final Report
William C. Daywitt Mar. 1984 48 p refs
(PB84-217884; NBS/TN-1074) Avail: NTIS HC A03/MF A01; also available SOD CSCL 14B

The design and construction of a coaxial thermal noise standard is described. The standard is designed to operate at the boiling point of liquid nitrogen with a noise temperature accurate to + or - 1 K in the frequency range from 1 GHz to 12.4 GHz. GRA

N85-10273# National Bureau of Standards, Boulder, Colo. Electromagnetic Fields Div.
THEORY OF NEAR-FIELD PHASED ARRAYS FOR ELECTROMAGNETIC SUSCEPTIBILITY TESTING
David A. Hill Feb. 1984 112 p refs
(PB84-217836; NBS/TN-1072) Avail: NTIS HC A06/MF A01; also available SOD CSCL 09E

The feasibility of using a near-field array for electromagnetic susceptibility testing is studied. The basic objective is to control the element weighting such that a plane wave is generated within the test volume. The basic theory is developed for arbitrary array geometries, and numerical results are obtained for finite planar arrays. A general near-field array synthesis technique is developed, and the technique minimizes the mean square error in the test volume while constraining the array excitations. The constraint prevents large currents and is useful in minimizing the fields outside the test volume. The basic idea looks promising, but some practical considerations, such as bandwidth and angular scanning limitations, require further theoretical and experimental investigation. Author (GRA)

N85-10672# Joint Publications Research Service, Arlington, Va.
UNDERWATER TELEVISION EQUIPMENT DESCRIBED
Dieter Borgelt, Arno Kiekbusch, Lutz Lippman, and Volker Schwuchow *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-84-030) 8 Aug. 1984 p 10-20 refs Transl. into ENGLISH from Radio Fernsehen Electron. (East Berlin), v. 32, no. 2, 1983 p 76-79
(For primary document see N85-10670 01-60)
Avail: NTIS HC A03/MF A01

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N85-10274 Department of the Air Force, Washington, D.C.
ISOLATED LOAD SWITCHING WITH SURGE SUPPRESSION Patent
T. G. Bezdek, inventor (to Air Force) Issued 24 Jul. 1984 5 p Supersedes AD-D009702
(AD-D011218; US-Patent-4,461,955; US-Patent-Appl-SN-394039; US-Patent-Class-250-551) Avail: US Patent and Trademark Office CSCL 09/5

Relay contacts provide the principal switching between a D.C. power source and the load. An SCR in series with a limiting turnon to absorb the inrushing surge to capacitors of the load. Optical couplers provide isolation from a remote control. A transistor blocking oscillator is coupled between one optical coupler and the trigger of the SCR for turn on. Delay timing includes a collector-base capacitor at a transistor of the other optical coupler. A Zener diode couples the timing circuit to a transistor amplifier, which operates the relay. The turn-on circuit is then disabled. A turn-off pulse to the second optical coupler turns off the transistor amplifier, which opens the relay. Author (GRA)

N85-10275# Simplex Digital Corp., Annandale, Va.
SEA WATER ROPE BATTERIES Final Technical Report, 15 Nov. 1983 - 15 May 1984
M. Walsh 15 May 1984 12 p
(Contract N00014-84-C-0056)
(AD-A144775) Avail: NTIS HC A02/MF A01 CSCL 10/3

This research demonstrated the feasibility of supplying approximately 1 watt of electrical power for one year on the sea bed with a novel battery, the rope battery. The proposed battery would look very much like a small diameter wire rope, possibly hundreds of feet long. This unusual shape permits the rope battery to take full advantage of the vastness of the ocean floor and permits at great pressure the steady diffusion of reaction products away from the battery itself. A sea water battery is described consisting of an inner bundle of coated wires which slowly corrode and an outer layer of fine wires which simultaneously provides strength, armor and surface area for slow hydrogen evolution. Two variations are examined. The fuse utilizes magnesium wires and burns slowly from the end. The rope utilizes lithium-zinc alloys and is slowly consumed along its entire length. GRA

N85-10276# Ohio State Univ., Columbus. ElectroScience Lab.
JOINT SERVICES ELECTRONICS PROGRAM Annual Report,

Mar. 1983 - Mar. 1984
Jun. 1984 146 p
(Contract N00014-78-C-0049)
(AD-A145085; ESL-710816-17; AR-7) Avail: NTIS HC A07/MF A01 CSCL 09/5

The research is in the area of electromagnetics and the specific topics are: (1) Diffraction Studies; (2) Hybrid Techniques; (3) Integral Equation Studies; (4) Time Domain; and (5) Transient Signature Measurements of Radar Targets for Inverse Scattering Research. It should be observed that much of the research reported herein is primarily directed toward the last two topics in the JSEP Electromagnetics Priority List for 1984. Specifically we are studying carefully the analysis of electromagnetic waves for lossy penetrable materials in the presence of a conducting surface. It is observed that this is a major undertaking and the effort required to complete it will take a substantial period of time. However, results will be forthcoming on a continuing basis. This is quite similar to the development of the UTD at the ElectroScience Laboratory which has been adopted by a vast number of users. Of course, we are continuing our well known research in the target identification area. Some of the hybrid work will also find further application in the fundamental understanding of coupling into complex structures. Thus, our efforts are already directed toward goals set by the funding agencies. GRA

N85-10277# Pennsylvania State Univ., University Park. Materials Research Lab.
PIEZOELECTRIC AND ELECTROSTRICTIVE MATERIALS FOR TRANSDUCER APPLICATIONS Annual Report
L. E. Cross, R. E. Newnham, G. R. Barsch, and J. V. Biggers May 1984 369 p
(Contract N00014-82-K-0339)
(AD-A145115) Avail: NTIS HC A16/MF A01 CSCL 20/3

A wide range of materials and devices were covered, including composite materials for transducer applications, electrostriction, and conventional piezoelectrics. In piezoelectric composites, progress was made in 3:1 and 3:2 perforated PZT polymer composites, and in transverse reinforced composites. Finite element calculations of stress distributions in 1:3 PZT polymer composites were carried out. Fresnoite glass ceramics have exhibited extreme stability to hydrostatic pressure, and high sensitivity. A new water quenching technique was used to develop PbTiO3, and a detailed analysis of resonant modes of 1:3 PZT epoxy composites was carried out. S.B.

N85-10278# Sanders Associates, Inc., Manchester, N. H. Microwave Div.
MANUFACTURING METHODS FOR MICROWAVE CIRCUITS Final Report, 27 Jul. 1982 - 22 Jun. 1984
H. W. Seymour, III, R. E. Bauman, and S. S. Y. Mak (NRL, Washington, D.C.) 22 Jun. 1984 36 p
(Contract N00014-82-C-2302)
(AD-A145237) Avail: NTIS HC A03/MF A01 CSCL 09/5

Two processes were investigated to manufacture microwave circuit films on hard dielectric substrates, and each proved superior when compared to the conventional wet chemical etching process. Ion beam milling was developed at the Microwave Division of Sanders Associates, Inc., and its high quality low cost capability instigated replacement of the wet chemical etch process. Up-plating was developed at the Microelectronics Center of the Naval Research Laboratories. Both methods demonstrate substantial improvements in the dimensional film definition achieved in manufacturing microwave circuits. Author (GRA)

N85-10279# Department of the Army, Washington, D. C.
BROADBAND TRANSVERSE FIELD INTERACTION CONTINUOUS BEAM AMPLIFIER Patent Application
L. J. Jasper, Jr., C. M. DeSantis, and J. F. Baxendale, inventors (to Army) Filed 6 Aug. 1984 39 p
(AD-D011229; US-Patent-Appl-SN-638183) Avail: NTIS HC A03/MF A01 CSCL 09/1

A broadband transverse field interaction continuous beam amplifier device comprised of an elongated continuous cathode modulating grid structure, an elongated continuous demodulating grid-collector structure, first or input waveguide transmission line means including the modulating grid for propagating an input RF wave transversely to an electron beam traveling from the cathode-grid structure to the output-collector structure where the electrons are bunched or modulated by the process of transverse wave interaction, and second or output waveguide transmission line means including the demodulating grid for propagating an induced amplified RF output wave resulting from prebunched electrons traversing the demodulator grid. Both input and output transmission line means include slow wave structures which are implemented in the grid structures. Author (GRA)

N85-10280# Department of the Army, Washington, D. C.
EXTRACTOR FOR SPRING-LOCK PIN CONNECTORS Patent Application
J. R. Long and J. A. Kerr, inventors (to Army) Filed 29 Jun. 1984 8 p
(AD-D011235; US-Patent-Appl-SN-626520) Avail: NTIS HC A02/MF A01 CSCL 09/5

An apparatus for the removal of connectors from printed circuit boards is disclosed. The connectors have spring-lock type conductor pins therein which secure the connectors to the printed circuit board in substantially permanent relation and if some conductor pins were to become defective the whole printed circuit board would be thrown away. The device of the present invention is disposed for removal of the connectors from the printed circuit board without causing damage to the board. Author (GRA)

N85-10281# Department of the Air Force, Washington, D.C.
CONDUCTOR STRUCTURE FOR THICK FILM ELECTRICAL DEVICE Patent Application
M. D. Adamo, C. U. Darter, and F. Cho, inventors (to Air Force) Filed 4 May 1984 23 p
(AD-D011240; US-Patent-Appl-SN-607094) Avail: NTIS HC A02/MF A01 CSCL 09/1

A thick film device conductor arrangement is described, suitable for making connections between a resiliently mounted element such as a surface acoustic delay line and adjacent thick film conductors and then with the device connecting pins. The thick film conductors include a double layer structure of differing noble metals each selected for desirable properties in designated areas of the device. GRA

N85-10282# Department of the Air Force, Washington, D.C.
TRANSVERSE FIELD INTERACTION MULTIBEAM AMPLIFIER Patent Application
L. J. Jasper, Jr., C. M. DeSantis, and J. F. Baxendale, inventors (to Air Force) Filed 2 Jul. 1984 21 p
(AD-D011241; US-Patent-Appl-SN-640184) Avail: NTIS HC A02/MF A01 CSCL 09/1

A transverse field interaction multi-beam amplifier device comprising a structure having, for example, a plurality of discrete cathodes cylindrically located in succession along a central axis of RF propagation is described. In registration with the cathodes are a respective number of annular collectors located within an outer cylinder which also acts as the structure housing. Intermediate to the cathodes and collectors are two additional coaxial cylinders, one having a relatively smaller diameter than the other, with the smaller diameter cylinder including respective number of discrete grids, while the large cylinder comprises a structure preferably having a rippled or undulating slow wave wall surface and a respective number of annular slots formed therein. GRA

N85-10283# Department of Energy, Washington, D. C.
NOISE ISOLATION SYSTEM FOR HIGH-SPEED CIRCUITS Patent Application
David R. McNeilly, inventor (to DOE) Filed 29 Dec. 1983 13 p
(Contract DE-AC05-8404-21400)
(DE84-014229; US-Patent-Appl-SN-566760) Avail: NTIS HC A02/MF A01

A noise isolation circuit is provided that consists of a dual function bypass which confines high-speed switching noise to the

component or circuit which generates it and isolates the component or circuit from high-frequency noise transients which may be present on the ground and power supply busses. A local circuit ground is provided which is coupled to the system ground by sufficient impedance to force the dissipation of the noise signal in the local circuit or component generating the noise. The dual function bypass network couples high-frequency noise signals generated in the local component or circuit through a capacitor to the local ground while isolating the component or circuit from noise signals which may be present on the power supply busses or system ground. The network is an effective noise isolating system and is applicable to both high-speed analog and digital circuits. DOE

N85-10284# Department of Energy, Washington, D. C.
MICROMINIATURE COAXIAL CABLE AND METHODS OF MANUFACTURE Patent Application
Wayne L. Bongianni, inventor (to DOE) Filed 29 Dec. 1983 10 p
(Contract W-7405-eng-36)
(DE84-014226; US-Patent-Appl-SN-566759) Avail: NTIS HC A02/MF A01

A coaxial cable is provided having a ribbon inner conductor surrounded by a dielectric and a circumferential conductor. The coaxial cable may be microminiature comprising a very thin ribbon strip conductor from between 5 to 15 (MU)m thick and from 150 to 200 (MU)m wide, having a surrounding foamed dielectric or parylene applied thereon by a vapor plasma process and an outer conductor of an adhering high conductivity metal vacuum deposited on the dielectric. Alternately the foam dielectric embodiment may have a continuous parylene coating applied adjacent the inner conductor or the outer conductor or both. Also, the cable may be fabricated by forming a thin ribbon of strip conductive material into an inner conductor, applying thereabout a dielectric by spraying on a solution of polystyrene and polyethylene and then vacuum depositing and adhering high conductivity metal about the dielectric. The cable strength may be increased by adding glass microfilament fibers or glass microballoons to the solution of polystyrene and polyethylene. Further, the outer conductive layer may be applied by electroless deposition in an aqueous solution rather than by vacuum deposition. A thin coating of parylene is preferably applied to the outer conductor to prevent its oxidation and inhibit mechanical abrasion. DOE

N85-10285# Department of Energy, Washington, D. C.
DC SWITCHING REGULATED POWER SUPPLY FOR DRIVING AN INDUCTIVE LOAD Patent Application
George R. Dyer, inventor (to DOE) Filed 29 Nov. 1983 21 p
(Contract DE-AC05-84OR-21400)
(DE84-014238; US-Patent-Appl-SN-555915) Avail: NTIS HC A02/MF A01

A dc switching regulated power supply for driving an inductive load is discussed. The regulator basic circuit is a bridge arrangement of diodes and transistors. First and second opposite legs of the bridge are formed by first and second parallel connected transistor arrays, respectively, while the third and fourth legs of the bridge are formed by appropriately connected first and second parallel connected diode arrays, respectively. A dc power supply is connected to the input of the bridge and the output is connected to the load. A servo controller is provided to control the switching rate of the transistors to maintain a desired current to the load. DOE

N85-10286# California Univ., Livermore. Lawrence Livermore Lab.
ELECTRONICS ENGINEERING DEPARTMENT: EE TECHNICAL REVIEW
Jul. 1984 31 p refs
(Contract W-7405-eng-48)
(DE84-016124; UCRL-50025-84-2) Avail: NTIS HC A03/MF A01

Four separate activities in electronic engineering are reported. The first is a study of current channeling in a high current rail gap switch. It is found that the degradation of the integrated power pulse with repeated use is a function of the material of the railgap surface. The second activity is the development of a low impedance pulse generator with a subnanosecond rise time. This generator operates at 50 kV and has a 1 ohm output impedance and a 2 to 10 nanosecond pulse length. The third activity is the design of a computer controlled system to diagnose the health of the 1600 flashlamp circuits in the Nova laser's pulsed power system. The lamp circuit diagnostic (LCD) system acquires data and detects thresholds for current waveforms; it also allows economical preshot testing of flashlamps at low energy. The fourth activity is the development of two versatile communications interface cards for use with LSI-11 computers. The heart of each card is a programmable microprocessor that relieves the computer of most of the communications chores. Built in protocols and a DMA architecture make them useful as general purpose interprocessor links. DOE

N85-10287# Westinghouse Research and Development Center, Pittsburgh, Pa.
DEVELOPMENT OF COPPER SULFIDE/CADMIUM SULFIDE THIN-FILM SOLAR CELLS Final Report, 13 Jul. 1979 - 31 May 1983
J. R. Szedon, S. V. Krishnaswamy, and P. G. McMullin May 1984 205 p refs
(Contract DE-AC02-83CH-10098)
(DE84-004513; SERI/STR-311-2353) Avail: NTIS HC A10/MF A01

Four major issues were addressed and resolved: process transferability, identification and control of key steps for high cell performance, low cost grid electrodes giving high cell efficiency, and elucidation and suppression of performance degrading mechanisms. Cell fabrication was shown to be transferable, with adequate attention given to the details of the CdS film deposition. A special apparatus was designed and tested with a gas knife to dry the cell surface and an enclosure to provide a flowing argon atmosphere for transfers to and from etch, barrier formation, and rise baths. Provisions of gold grid electrodes by selective electroplating of gold resulted in cell efficiency values up to 30% higher than for a standard processing with thick evaporated gold electrodes. Better understanding was gained of factors which affect the degradation of cell performance in atmospheres containing moisture and air. Nonthermal effects of laser treatment were shown to suppress or delay degradation of cell performance. DOE

N85-10288# Argonne National Lab., Ill.
BATTERY OPTIMIZATION CONSIDERATIONS
William J. Walsh and William W. Marr 1983 20 p refs Presented at the EHV Systems Assessment Seminar, Gainesville, Fla., 14 Dec. 1983
(Contract W-31-109-eng-38)
(DE84-014759; CONF-831272-4) Avail: NTIS HC A02/MF A01

A computerized method for establishing battery requirements for electric vehicles has been developed. This system, which is called Eva (Electric Vehicle Analysis), enables least cost analyses for optimizing battery characteristics tailored to specific vehicle types and missions. Eva is a user friendly, interactive software package which allows complex battery and vehicle optimization with relative ease. Key features of Eva include extensive modeling of battery interrelationships and a consistent attempt to avoid premature specification of any parameter. An equation for life cycle cost is derived in terms of mission requirements, battery characteristics, and vehicle factors. Advance specification is limited to electrochemical system, vehicle class, and mission requirements. Eva determines the combination of battery characteristics which results in least cost while fully satisfying the mission requirements. The objective is to establish battery requirements of minimum difficulty which lead to electric vehicle batteries of satisfactory performance and maximum cost competitiveness. DOE

N85-10289# Argonne National Lab., Ill.
ADVANCED FUEL CELL DEVELOPMENT Progress Report, Jul. - Sep. 1983
Jun. 1984 50 p refs
(Contract W-31-109-eng-38)
(DE84-014847; ANL-84-9) Avail: NTIS HC A03/MF A01

Fuel cell research and development activities at Argonne National Laboratory (ANL) during the period July through September 1983 are discussed. These efforts were directed principally toward seeking alternative cathode materials to NiO for molten carbonate fuel cells. An investigation was made of the thermodynamically stable phases formed under cathode conditions with a number of transition metal oxides. Prospective alternative cathode materials are being synthesized and doped to promote electronic conductivity. Three materials-LiFeO2, Li2MnO3, and ZnO were doped to give suitable conductivity. These materials are being further tested for solubility and ion migration in the cell environment. Techniques are being studied for the preparation of thin electrode and electrolyte materials by tape casting, and a creep-resistant superstructure for the anode is under development. DOE

N85-10290# Bielefeld Univ. (West Germany). Zentrum fuer interdisziplinaere Forschung.
SCATTERING THEORY BY ENSS' METHOD FOR OPERATOR VALUED MATRICES: DIRAC OPERATOR IN AN ELECTRIC FIELD
P. L. Muthuramalingam (Indian Statistical Inst., New Delhi, India) Apr. 1984 28 p refs
(Rept-64) Avail: NTIS HC A03/MF A01

A scattering theory is developed and asymptotic completeness proved using geometric methods for a class of partial differential operators with long range potentials on [L sup 2 (R sup n)] sup m. The Dirac operator with an electric field in [L sup 2 (R sup 3)] sup 4 is treated. Author (ESA)

N85-10291# Transportation Systems Center, Cambridge, Mass.
POLYCHLORINATED BIPHENYLS (PCBS) IN TRANSIT SYSTEM ELECTRICAL EQUIPMENT Final Report, Jan. - Jul. 1983
Washington DOT May 1984 101 p refs
(Grant DOT-UMTA-MA-06-0098)
(PB84-222207; DOT-TSC-UMTA-84-15; UMTA-MA-06-0098-84-1) Avail: NTIS HC A06/MF A01 CSCL 09A

The legislative history and current regulatory requirements concerning the continued use of PolyChlorinated Biphenyls PCBs in transit system electrical equipment are presented. The recent rule-making by the EPA is presented in summary form to aid the reader in following the chronology of requirements affecting the continued operation, servicing, marking, and disposal of transit system electrical equipment which contains PCB materials. Types of transit system electrical equipment regulated by the EPA are identified and future regulatory requirements concerning allowable PCB concentration levels of specific electrical equipment are outlined. Transit system procedures for the handling of electrical equipment containing PCBs are presented and recommendations to assist transit systems in eliminating PCBs from electrical equipment are provided. GRA

N85-10292# National Bureau of Standards, Washington, D.C. Center for Electronics and Electrical Engineering.
CENTER FOR ELECTRONICS AND ELECTRICAL ENGINEERING TECHNICAL BULLETIN COVERING CENTER PROGRAMS WITH 1984 CEEE EVENTS CALENDAR Progress Report, Jan. - Mar. 1984
J. Franklin Mayo-Wells May 1984 20 p
(PB84-222785; NBSIR-84-2877-1) Avail: NTIS HC A02/MF A01 CSCL 09D

A quarterly abstract journal is presented covering the work of the National Bureau of Standards Center for Electronics and Electrical Engineering. This issue covers the first quarter of calendar year 1984. Abstracts are provided by technical area for both published papers and papers approved by NBS for publication. GRA

N85-10293# National Bureau of Standards, Washington, D.C. Center for Electronics and Electrical Engineering.
CENTER FOR ELECTRONICS AND ELECTRICAL ENGINEERING TECHNICAL BULLETIN COVERING CENTER PROGRAMS WITH 1984 CEEE EVENTS CALENDAR Progress Report, Oct. - Dec. 1983
J. Franklin Mayo-Wells, comp. Apr. 1984 22 p
(PB84-223684; NBSIR-84-2857-4) Avail: NTIS HC A02/MF A01 CSCL 09D

A quarterly abstract journal covering the work of the National Bureau of Standards Center for Electronics and Electrical Engineering is presented. This issue covers the fourth quarter of calendar year 1983. Abstracts are provided by technical area for both published papers and papers approved by NBS for publication. Topics on semiconductors, signal processing, and electrical systems are discussed. GRA

N85-10294# National Bureau of Standards, Washington, D.C. Center for Electronics and Electrical Engineering.
BIBLIOGRAPHY OF DATA ON ELECTRICAL BREAKDOWN IN GASES Final Report
R. J. VanBrunt and W. E. Anderson Apr. 1984 174 p refs Sponsored in part by DOE
(PB84-218049; NBS/TN-1185) Avail: NTIS HC A08/MF A01; also available SOD CSCL 20C

A bibliography of currently published data on electrical breakdown in gases is presented. The bibliography contains a list of archival papers and books published since 1950, an index indicating the references that give particular types of data for each gas, and author index, and a list of relevant, regular technical conferences. The 465 citations given in the bibliography contain experimental or theoretical data on breakdown which include: (1) sparking potentials; (2) breakdown voltages; (3) critical fields, or field-to-gas density ratios; (4) corona inception voltages; (5) voltage-time characteristics; (6) relative and absolute dielectric strengths; and (7) breakdown probabilities. Types of data considered include those which apply to uniform and nonuniform fields; ac, dc, and impulse voltages; and possible effects of particles, surfaces, interfaces, and corona. GRA

N85-10295# National Bureau of Standards, Washington, D.C. Center for Electronics and Electrical Engineering.
CENTER FOR ELECTRONICS AND ELECTRICAL ENGINEERING TECHNICAL BULLETIN COVERING CENTER PROGRAMS Progress Report, Jul. - Sep. 1983
J. Franklin Mayo-Wells, comp. Jun. 1984 16 p
(PB84-219716; NBSIR-84-2857-3) Avail: NTIS HC A02/MF A01 CSCL 09C

A quarterly abstract journal covering the work of the National Bureau of Standards Center for Electronics and Electrical Engineering is presented. The issue covers the third quarter of calendar year 1983. Abstracts are provided by technical area for both published papers and papers approved by NBS for publication. Topics include semiconductor technology, fast signal metrology and electrical power systems metrology. GRA

N85-10296# National Bureau of Standards, Washington, D.C. Center for Electronics and Electrical Engineering.
CENTER FOR ELECTRONICS AND ELECTRICAL ENGINEERING TECHNICAL BULLETIN COVERING CENTER PROGRAMS Progress Report, Apr. - Jun. 1983
J. Franklin Mayo-Wells Jun. 1984 19 p
(PB84-218056; NBSIR-84-2857-2) Avail: NTIS HC A02/MF A01 CSCL 09C

This is the third issue of a quarterly abstract journal covering the work of the National Bureau of Standards Center for Electronics and Electrical Engineering. This issue of the CEEE Technical Progress Bulletin covers the second quarter of calendar year 1983. Abstracts are provided by technical area for both published papers and papers approved by NBS for publication. GRA

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N85-10297 Max-Planck-Inst. fuer Quantenoptik, Garching (West Germany).
SELF-SIMILAR EXPANSION OF DENSE MATTER DUE TO HEAT TRANSFER BY NONLINEAR CONDUCTION
R. Pakula and R. Sigel Dec. 1983 41 p refs
(MPQ-81) Copyright. Avail: Issuing Activity

The ablative heat wave from a dense body suddenly brought into contact with a thermal bath with a temperature of the order of 100,000 to 100 million K is investigated. It is shown that the hydrodynamic equations with nonlinear conduction admit a self-similar solution of the asymptotic type, i.e., approached by the flow for t tends to infinity. Self-similarity is a consequence of the fact that the solid may be considered as infinitely dense in this limit, even for a bath temperature varying in time. The self-similar solution is calculated and scaling relations for the hydrodynamic variabes are given. Numerical values are obtained for the radiative heating of gold. The range of validity of the solution is discussed. Author (ESA)

N85-10298 Prins Maurits Lab. TNO, Rijswijk (Netherlands).
DYNKIN: A COMPUTER PROGRAM FOR THE DESCRIPTION OF DETAILED GAS REACTIONS IN INTERACTION WITH GAS DYNAMICS [DYNKIN. EEN COMPUTERPROGRAM VOOR HET BESCHRIJVEN VAN GEDETAILLEERDE GASREACTIES IN WISSELWERKING MET DE GASDYNAMICA]
T. W. J. vandeBeek Feb. 1984 59 p refs In DUTCH; ENGLISH summary
(Contract A76/KL/039)
(AD-B085364; PML-1984-22; TDCK-79372) Copyright. Avail: Issuing Activity

The computer code DYNKIN (FORTRAN 5) with which detailed gas reactions in interaction with gas dynamics can be simulated was developed. The code is suitable for problems involving one-dimensional, Cartesian coordinates; nonviscous gases; non-conductive heat-and mass transport; ideal gas law. Modelling is limited to processes in which the velocities are relatively high (as in detonations). Calculations of a detonation in a stoichiometric hydrogen-air mixture are described. Recommendations for the improvement of the code are given, such as the implementation of conductive heat transport and the extension to spherical/cylindrical coordinates, to treat subsonic processes, such as deflagrations. Author (ESA)

N85-10299# Cambridge Univ. (England). Dept. of Engineering.
MEASUREMENT OF THE DEVELOPMENT OF THE BOUNDARY LAYER IN THE ANNULUS WALLS OF A FOURSTAGE COMPRESSOR
N. A. Cumpsty 1984 23 p refs
(CUED/A-Turbo-TR-121; ISSN-0309-6521) Avail: NTIS HC A02/MF A01

There are few available measurements of boundary layers in multistage compressors when the repeating stage condition is reached. Tests were performed in a small four stage compressor; the flow was essentially incompressible and the Reynolds number based on blade chord was about 50,000. Two series of tests were performed: in one series the full design number of blades were installed; in the other series half the blades were removed to reduce the solidity and double the staggered spacing. Initially it was wished to examine the hypothesis proposed by L. H. Smith that staggered spacing is a particularly important scaling parameter for boundary layer thickness; the tests tend not to bear out this view. The integral thicknesses agree quite well with those published by Smith. Author

N85-10300*# National Aeronautics and Space Administration, Washington, D. C.
STABILITY OF FLUID FLOW IN A CYLINDRICAL ANNULUS
Hubert Ludwieg Aug. 1984 17 p refs Transl. into ENGLISH from Z. fuer Flugwiss. (West Germany), v. 8, no. 5, May 1960 p 135-140 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-77720; NAS 1.15:77720) Avail: NTIS HC A02/MF A01 CSCL 20D

Helical flow in an annulus between two coaxial cylinders is investigated with regard to its stability against the formation of helical vortices of the type known as Taylor's annular vortices. Assuming the annulus to be small and the velocities to vary linearly with radius, it is shown that the problem can be reduced to the classical case of flow between two rotating cylinders. An appropriate stability criterion for helical flows is derived from Rayleigh's stability criterion applicable to such flows. M.G.

N85-10301*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CLASSICAL FREE-STREAMLINE FLOW OVER A POLYGONAL OBSTACLE Final Report
Alan R. Elcrat (Wichita State Univ., Kansas) and Lloyd N. Trefethen (Massachusetts Inst. of Tech.) Sep. 1984 24 p refs
(Contracts NAS1-17070; DE-AC02-76ER-03077-V)
(NASA-CR-172448; ICASE-84-45; NAS 1.26:172448) Avail: NTIS HC A02/MF A01 CSCL 20D

In classical Kirchhoff flow, an ideal incompressible fluid flows past an obstacle and around a motionless wake bounded by free streamlines. Since 1869 it has been known that in principle, the two-dimensional Kirchhoff flow over a polygonal obstacle can be determined by constructing a conformal map onto a polygon in the log-hodograph plane. In practice, however, this idea has rarely been put to use except for very simple obstacles, because the conformal mapping problem has been too difficult. This paper presents a practical method for computing flows over arbitrary polygonal obstacles to high accuracy in a few seconds of computer time. We achieve this high speed and flexibility by working with a modified Schwarz-Christoffel integral that maps onto the flow region directly rather than onto the log-hodograph polygon. This integral and its associated parameter problem are treated numerically by methods developed earlier by Trefethen for standard Schwarz-Christoffel maps. Author

N85-10302*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
REVIEW OF SOME VORTEX RELATIONS Final Report
Egon Krause Sep. 1984 10 p refs
(Contract NAS1-17070)
(NASA-CR-172452; ICASE-84-46; NAS 1.26:172452) Avail: NTIS HC A02/MF A01 CSCL 20D

The evaluation of the circulation from numerical solutions of the momentum and energy equations is discussed for incompressible and compressible flows. It is shown how artificial damping directly influences the time ratio of change of the circulation. Author

N85-10303*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE EFFECT OF CHANNEL CONVERGENCE ON HEAT TRANSFER IN A PASSAGE WITH SHORT PIN FINS
Barbara A. Brigham Oct. 1984 17 p refs
(NASA-TM-83801; E-2306; NAS 1.15:83801) Avail: NTIS HC A02/MF A01 CSCL 20D

Array averaged heat transfer coefficients were obtained for two configurations of short pin fins in a converging channel and for two flat plate configurations in a converging channel. The effect of flow acceleration due to channel convergence and the effect of varying pin length on the heat transfer was determined. Results are presented in the form of Nusselt number versus Reynolds number for the four geometries tested. Author

N85-10304# National Aerospace Lab., Tokyo (Japan).
THE PROPERTIES OF PLANE TURBULENT BUOYANT JET
Hiroshi Ishigaki Jan. 1984 10 p refs In JAPANESE; ENGLISH summary
(NAL-TR-798; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

The plane turbulent buoyant jet issuing vertically into quiescent fluid is studied analytically. Formulae on maximum velocity, temperature and entrainment rate are derived. These formulae agree well with the available experimental data for the whole region of jet and plume. Quantitative classifications of the flow regime of jet, transition and plume are given for the nondimensional distance from the jet exit. Author

N85-10305*# National Aeronautics and Space Administration, Washington, D. C.
SECOND ALL-UNION SEMINAR ON HYDROMECHANICS AND HEAT AND MASS EXCHANGE IN WEIGHTLESSNESS, SUMMARIES OF REPORTS
G. Z. Gershuni, ed. and Ye. M. Zhukhovitskiy, ed. Jul. 1984 185 p refs Transl. into ENGLISH of proceedings of the 2nd All-Union Seminar on Hydromech. and Heat and Mass Exchange in Weightlessness, 1981 p 1-186 Seminar held in USSR, 1981 Original language document was announced as N84-18576 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-77590; NAS 1.15:77590) Avail: NTIS HC A09/MF A01 CSCL 20D

Abstracts of reports are given which were presented at the Second All Union Seminar on Hydromechanics and Heat-Mass Transfer in Weightlessness. Topics include: (1) features of crystallization of semiconductor materials under conditions of microacceleration; (2) experimental results of crystallization of solid solutions of CDTE-HGTE under conditions of weightlessness; (3) impurities in crystals cultivated under conditions of weightlessness; and (4) a numerical investigation of the distribution of impurities during guided crystallization of a melt. E.A.K.

N85-10306*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A REVIEW AND ANALYSIS OF BOUNDARY LAYER TRANSITION DATA FOR TURBINE APPLICATION
Raymond E. Gaugler Washington 1984 14 p refs Presented at the 13th Intern. Gas Turbine Conf. and Exhibit, Houston, Tex., 17-21 Mar. 1984; sponsored by the American Society of Mechanical Engineers
(NASA-TM-86880; E-2341; NAS 1.15:86880) Avail: NTIS HC A02/MF A01 CSCL 20D

A symposium on transition in turbines was held at the NASA Lewis Research Center. One recommendation of the working groups was the collection of existing transition data to provide standard cases against which models could be tested. A number of data sets from the open literature that include heat transfer data in apparently transitional boundary layers, with particular application to the turbine environment, were reviewed and analyzed to extract transition information from the heat transfer data. The data sets reviewed cover a wide range of flow conditions, from low speed, flat plate tests to full scale turbine airfoils operating at simulated turbine engine conditions. The results indicate that free stream turbulence and pressure gradient have strong, and opposite, effects on the location of the start of transition and on the length of the transition zone. R.S.F.

N85-10307# Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
LAMINAR FLOW HEAT EXCHANGERS. VISCOSITY INDUCED NON-UNIFORM FLOW M.S. Thesis
G. R. Putnam Jun. 1984 33 p
(Contract N66314-70-A-0073)
(AD-A144777) Avail: NTIS HC A03/MF A01 CSCL 13/1

Laminar flow heat exchangers which cool oil in non-interconnected parallel passages can experience non-uniform flows and reduction in the effective heat exchanger coefficient in a range of Reynolds number which varies with tube length and diameter, tube wall temperature and fluid inlet temperature. The method of predicting the reduction in effective heat transfer coefficient and the range of Reynolds number over which these instabilities exist is presented for a particular oil Mobil aviation oil 120. Also included is the prediction of the effect of radial viscosity variation on the constant property magnitudes of friction and heat transfer coefficient. GRA

N85-10308# University of Southern California, Los Angeles. Dept. of Aerospace Engineering.
DYNAMICS OF LIQUID DROPLETS IN THE SPACE ENVIRONMENT Final Report, 10 May 1982 - 30 Sep. 1983
E. P. Muntz and M. Dixon Aug. 1984 71 p
(Contract F04611-82-K-0040)
(AD-A145070; AFRPL-TR-84-045) Avail: NTIS HC A04/MF A01 CSCL 20/4

This report discusses the angular and speed dispersions of streams of liquid droplets in a high vacuum. Measurements of angular and speed dispersions of several droplet streams of low pressure liquids are reported. The results are interpreted with reference to proposed physical mechanisms for generating the observed dispersions. Typically, angular dispersions are around 2 microrad and speed dispersions around .000015 of the stream average speed. An addendum discusses the results relative to proposed Air Force system uses. GRA

N85-10309# Department of Energy, Washington, D. C.
HEAT EXCHANGER Patent Application
Phillip J. Brackenbury, inventor (to DOE) Filed 8 Dec. 1983 14 p
(Contract DE-AC06-76FF-02170)
(DE84-014299; US-Patent-Appl-SN-559505) Avail: NTIS HC A02/MF A01

A heat exchanger comprising a shell attached at its open end to one side of a tube sheet and a detachable head connected to the other side of the tube sheet is disclosed. The head is divided into a first and second chamber in fluid communication with a nozzle inlet and nozzle outlet, respectively, formed in tube sheet. A tube bundle is mounted within the shell and is provided with inlets and outlets formed in the tube sheet in communication with the first and second chambers, respectively. DOE

N85-10310# California Univ., Livermore. Lawrence Livermore Lab.
ICARUS: A GENERAL ONE-DIMENSIONAL HEAT CONDUCTION CODE
S. B. Sutton 20 Jul. 1984 57 p refs
(Contract W-7405-eng-48)
(DE84-016125; UCID-20125) Avail: NTIS HC A04/MF A01

A computer code for calculating one dimensional planar, cylindrical or spherical conduction heat transfer is described. The model can account for material phase change (solidification or melting, multiple material regions, temperature dependent material properties and time or temperature dependent boundary conditions. Finite difference techniques are used to discretize the differential equations. The resulting system of tri-diagonal equations are solved using a standard tri-diagonal reduction method. The equations are formulated so that the solution can be fully implicit, fully explicit or a user specified degree of mix. Six sample problems that compare numerical predictions to analytical solutions are discussed. Operation of the computer code and all input variables are described. Input file listings and typical edits for the six sample problems are given. DOE

N85-10311# State Univ. of New York, Stony Brook. Dept. of Mechanical Engineering.
VERTICAL CHANNEL FREE CONVECTION FOR A POWER LAW FLUID WITH A CONSTANT HEAT FLUX
Thomas F. Irvine, Jr. and William J. Schneider 8 Aug. 1984 8 p refs Presented at the 22nd Natl. Heat Transfer Conf., Niagara Falls, N.Y., 5-8 Aug. 1984 Prepared in cooperation with BNL
(Contract DE-AC02-76CH-00016)
(DE84-014551; BNL-34924; CONF-840816-14) Avail: NTIS

HC A02/MF A01

The development of free convection in a purely viscous non-Newtonian fluid under the influence of a uniform wall heat flux is investigated. A finite difference solution is presented of the velocity and temperature profiles for the flow of an Ostwald-de Waele (power law) fluid between two symmetrically heated vertical plates. The flow, temperature and heat transfer characteristics of the channel are presented in a dimensionless manner as related to the generalized Grashof and Prandtl numbers and the fully developed flow range is established. The numerical solutions for the developing flow are shown to approach two classical asympototes - fully developed duct free convection atlow Rayleigh numbers and two independent vertical plates at high Rayleigh numbers. A comparison is made between the results of this theoretical investigation and previously published analytical and experimental work on Newtonian and non-Newtonian fluids. The results and their application to engineering problems are discussed. The changes caused by the addition of soluble substances to water cause significant variations in the mean flow between the plates and in the outlet temperature. DOE

N85-10312# Battelle Columbus Labs., Ohio.
CHEMICAL HEAT PUMP STATE-OF-THE-ART SURVEY Final Report
W. T. Hanna, H. H. Krause, W. Friedel, and Y. Yanase 10 Aug. 1983 301 p refs
(Contract DE-AC05-84OR-21400)
(DE84-013552; ORNL/Sub-83-13876/1) Avail: NTIS HC A14/MF A01

In addition to the survey of industrial chemical heat pumps (ICHP) in the US, both the European and Japanese developments were surveyed. These developments are reviewed and the ICHP's are grouped by temperature range. DOE

N85-10313# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Forschungsbereich Stroemungsmechanik.
OIL FLOW PATTERNS OF SEPARATED FLOW ON A HEMISPHERICAL CYLINDER AT INCIDENCE
Hans Bippes and Michael Turk May 1984 60 p refs
(DFVLR-FB-84-20) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 20.50

The structure of the flow in the separated region on a hemispherical cylinder at incidence was studied with flow visualization. Skin-friction patterns developing in dependence upon flow parameters were examined. Using the manifold of skin-friction patterns, simple basic structures are identified, from which the most complicated ones found in the tests can be derived. In the unstable laminar flow range, closed separated regions with the features of two-dimensional separation bubbles are observed. In stable laminar flow the spatial vortex structure of the separated region was also visualized. It shows that the vorticity, convected from the surface, concentrates along different axes, which leads to steady and unsteady vortex motions depending on the direction of the vortex axes with respect to the mean flow. Author (ESA)

N85-10314# GKSS-Forschungszentrum Geesthacht (West Germany). Inst. fuer Anlagentechnik.
THERMAL FLUID-STRUCTURE INTERACTION: A FEW SCALING CONSIDERATIONS
B. Dimitrov and H. Schwan 1984 38 p refs Sponsored by International Atomic Energy Agency, Vienna
(GKSS-84-E-18; ISSN-0344-9629) Avail: NTIS HC A03/MF A01

Scaling laws for modeling nuclear reactor systems were improved by including parameters concerning structural heat, because during thermal transients there is a strong coupling between the thermalhydraulic system and the surrounding structures. Volumetric scaling laws were applied to a straight pipe of the primary loop of a pressurized water reactor (PWR). For the prototype, pipe data of a KWU standard PWR with four loops were chosen. Theoretical studies and RELAP 5/MOD 1 calculations regarding the influence of structural heat on thermalhydraulic response of the fluid were performed. Recommendations for minimization of distortions due to influence of structural heat between model and prototype are given. Author (ESA)

N85-10315# GKSS-Forschungszentrum Geesthacht (West Germany). Inst. fuer Anlagentechnik.
VOID FRACTION MEASUREMENTS PERFORMED IN A VERTICAL LARGE DIAMETER TUBE COMPARED TO DIFFERENT PREDICTING CORRELATIONS
A. Katsaounis and M. Kuehns 1984 22 p refs Presented at European Two-Phase Flow Group Meeting, Rome, 18-21 Jun. 1984
(GKSS-84-E-24; ISSN-0344-9629) Avail: NTIS HC A02/MF A01

Steady state and oscillating two phase flow conditions in the vertical branch of a T-junction were observed in order to find the void fraction needed to predict two phase flow pressure drop in the junction. Void fraction measurements were compared with correlations and with a numerical approximation of the Marchaterre and Hoglund diagram. Results show that the different correlations can be used favorably only in particular ranges of the flow regimes. Author (ESA)

N85-10316# GKSS-Forschungszentrum Geesthacht (West Germany). Inst. fuer Anlagentechnik.
VISUALIZATION OF THE DIVERGING TWO-PHASE FLOW PATTERN IN A HORIZONTAL T-JUNCTION WITH VERTICAL BRANCH
A. Katsaounis and H. D. Fuerst 1984 13 p Presented at European Two-Phase Group Meeting, Rome, 18-21 Jun. 1984
(GKSS-84-E-25; ISSN-0344-9629) Avail: NTIS HC A02/MF A01

A video camera recorded the air-water dividing flow pattern in a T-junction. Stratified and wavy stratified flow in the horizontal tube were studied. Depending on superficial velocities of gas and water flow in the horizontal tube, co- and counter-current flow is observed in the vertical tube. The flow oscillation behavior in the T-junction was compared qualitatively to the measured oscillations of pressure and pressure drop. Author (ESA)

N85-10317# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
PLANAR JETS IMPINGING ON VARIOUS OBSTACLES AND SOME MODES OF FLOW OSCILLATION
W. M. Jungowski (Husky Research Corp., Calgary, Canada) and G. E. A. Meier 1984 360 p refs
(MPIS-Mitt-78; ISSN-0374-1257) Avail: NTIS HC A16/MF A01

Planar jets impinging on obstacles in a wind tunnel were studied. Eight different types of self-sustained flow oscillations were identified during experiments with 30 configurations. Mechanisms of these oscillations are discussed and results characterizing the flow with all configurations are given. Mach-Zehnder interferograms, fluctuating pressure- and velocity-time traces, and corresponding spectra are presented. Author (ESA)

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation,* and *19 Spacecraft Instrumentation.*

N85-10318 Department of the Air Force, Washington, D.C.
THICK FILM RADIATION DETECTOR Patent
B. Contreras, inventors (to Air Force) Issued 31 Jul. 1984 5 p Supersedes AD-D010346
(AD-D011211; US-Patent-4,463,262; US-Patent-Appl-SN-304123; US-Patent-Class-250-349) Avail: US Patent and Trademark Office CSCL 17/5

An improved radiation detector is provided which comprises a thick film of thermistor material deposited upon a substrate of

beryllium oxide, alumina or other suitable material having high thermal conductivity. The substrate is soldered to and supported by a heat sink. The detector films of this invention may be deposited in pairs, one element of each pair being shielded, to compensate for temperature fluctuations. An array of detector pairs of this invention may be constructed to measure laser beam intensity across the breadth of the beam to ascertain the intensity profile of the incident beam. Author (GRA)

N85-10319 Department of the Air Force, Washington, D.C.
PROGRAMMABLE DIGITAL TEMPERATURE CONTROLLER APPARATUS Patent
B. J. Veneklase, inventor (to Air Force) Issued 31 Jul. 1984 9 p Supersedes AD-D010304
(AD-D011221; US-Patent-4,463,436; US-Patent-Appl-SN-324347; US-Patent-Class-364-557) Avail: US Patent and Trademark Office CSCL 13/1

A programmable digital temperature controller apparatus utilizing a pair of binary-coded decimal units and a switching unit to generate a ten bit binary word which represents a pre-selected temperature in a temperature range is discussed. A pair of erasable programmable read only memory units store digital temperatures and temperature range information. The ten bit binary word determines which digital data from the memory units will be applied to a D/A converter unit and a pair of multiplexer units. One multiplexer unit controls the voltage per bit within the D/A converter unit while the other multiplexer unit generates a starting voltage. The output voltage from the D/A converter unit and the starting voltage are summed together to provide a voltage output signal which represent the pre-selected temperature. Author (GRA)

N85-10320 Bayerische Akademie der Wissenschaften, Munich (West Germany). Geodaetische Kommission.
SINGLE VIEWPOINT SELF CALIBRATION: A CONTRIBUTION TO FIELD CALIBRATION OF RECORDING CHAMBERS Thesis - Bonn University [EINZELSTANDPUNKT-SELBSTKALIBRIERUNG-EIN BEITRAG ZUR FELDKALIBRIERUNG VON AUFNAHMEKAMMERN]
Wilfried Wester-Ebbinghaus 1983 48 p refs In GERMAN
(Ser-C-289; ISBN-3-7696-9339-6; ISSN-0065-5325) Copyright. Avail: Issuing Activity

A mathematical formulation of the single viewpoint self calibration method is presented, and its performance is determined by test data. The method does not require that the recorded object be spatially arranged and that the signalization of the objects points be prepared for aimings from different directions. Projection center, rotation center, or rotation axis of the recording chamber can be considered as spatially invariable and taken into account in the calibration process as instrumental conditions. The calibration can be incorporated into a bundle adjustment. This supports the calibration by additional information, and enables use of the method for off-line test field calibration and for on-line, in the framework of a bundle triangulation for a simultaneous system calibration. The method can be used to reinforce the general image correlation. Author (ESA)

N85-10321# National Electrical Engineering Research Inst., Pretoria (South Africa).
AN OPTICALLY ISOLATED AMPLIFIER
C. J. Smith Nov. 1982 21 p refs
(CSIR-SR-ELEK-257) Avail: NTIS HC A02/MF A01

The design presented was used for biomedical signal detection and monitoring. The amplifier was successfully applied for EMG and ECG research studies. The patient is safely isolated from the processing equipment when using the amplifier. This opto-isolated amplifier was also applied industrially for monitoring mercury arc rectifier control signals. The device has proved itself in an industrial environment as an interface for a microprocessor. This unit can be used whenever large offset voltages are found, and can therefore be put to good use in many power electrical engineering applications. B.G.

N85-10322*# National Aeronautics and Space Administration, Washington, D. C.
PLATINUM THIN FILM RESISTORS AS ACCURATE AND STABLE TEMPERATURE SENSORS
W. Diehl Sep. 1984 16 p Transl. into ENGLISH of conf. paper "Platin-Dunnschicht-Widerstande als Genaue und Stabile Temperatur-Sensoren" presented at Sensor '82 - Sensor Technol. and Temp. Meas. Conf., 1982 p 89-101 Conf. held in Essen, 12-14 Jan. 1982 Original language document was announced as A84-15370 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(NASA-TM-77728; NAS 1.15:77728) Avail: NTIS HC A02/MF A01 CSCL 14B

The measurement characteristics of thin-Pt-film temperature sensors fabricated using advanced methods are discussed. The limitations of wound-wire Pt temperature sensors and the history of Pt-film development are outlined, and the commonly used film-deposition, structuring, and trimming methods are presented in a table. The development of a family of sputtered film resistors is described in detail and illustrated with photographs of the different types. The most commonly used tolerances are reported as + or - 0.3 C + 0.5 percent of the temperature measured. T.K. (IAA)

N85-10323# School of Aerospace Medicine, Brooks AFB, Tex.
A LIMBUS-SENSING EYE MOVEMENT RECORDER Final Report, Jun. 1982 - Jun. 1983
E. J. Engelken, K. W. Stevens, J. W. Wolfe, and J. T. Yates Jul. 1984 11 p
(AF Proj. 7755)
(AD-A144772; USAFSAM-TR-84-29) Avail: NTIS HC A02/MF A01 CSCL 05/10

A limbus-sensing eye movement recorder has been designed to measure horizontal eye position. The recorder uses a modulated infrared light source and a synchronous detector to produce accurate recordings in the presence of ambient light. The recording system bandwidth is dc to 15 Hz, and the signal-to-noise ratio is better than 50 dB. Overall system accuracy is about 0.5 deg for horizontal eye movement in the + or - 25 deg range. GRA

N85-10324# Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
DEVELOPMENT OF A FLOATING ELEMENT WALL SHEAR TRANSDUCER M.S. Thesis
S. W. Petri Jun. 1984 77 p
(Contracts N66314-70-A-0073; N00014-78-C-0696)
(AD-A144794) Avail: NTIS HC A05/MF A01 CSCL 09/1

A passive floating element wall shear transducer has been developed which uses a sensitive frequency modulation technique to measure a capacitance change proportional to the displacement of the floating element for small deflections. The floating element is 4-mm square surrounded by a gap nominally 0.18 mm and protrudes into the boundary layer 0.10 mm. Scaled on inner parameters, each side of the sensing head measures about 290, the mean gap width is 13, and the element protrusion is 7. The transducer was tested in a turbulent boundary layer on a flat plate at Re sub x = 1.46 million and 1.95 million and the results compared to wall shear stress estimates obtained from the law of the wall. The transducer was found to over-predict the steady mean wall shear stress by a factor of two, indicating the importance of improving the alignment of the sensing head with the top of the plate and highlighting the need for an in situ calibration. Transducer measurement of the unsteady mean wall shear stress was severely limited by a mechanical resonance in the transducer at 63 Hz. The operating principles and general characteristics of the transducer are discussed, its performance is evaluated, and recommendations are made concerning future work. Author (GRA)

N85-10325# Army Engineer Topographic Labs., Fort Belvoir, Va.
REQUIREMENTS AND SPECIFICATIONS FOR CARTOGRAPHIC VIDEO DISCS
D. J. Costanzo Jun. 1984 18 p
(AD-A144906; ETL-R-066) Avail: NTIS HC A02/MF A01 CSCL 06/2

Video discs can store large quantities of analog (paper, film,

and video tape) and digital cartographic products on a compact, nonvolatile medium. These discs can be interfaced with microcomputers to provide compact and portable systems for accessing this cartographic information. Such interactive video disc systems could be used for terrain analysis, navigation, map use training, and command and control. Video discs used for cartographic data storage should be treated as mapping products in the same way as analog and digital cartographic products. Thus, there is a need to develop requirements and specifications to design and to produce these video discs. Particular attention is needed in the following seven areas: planning, gathering source materials, filming, transferring film to video tape, mastering, replicating, and developing software. The U.S. Army Engineer Topographic Laboratories (ETL) recently began research into requirements and specifications for these video discs. ETL is developing experimental cartographic video discs, investigating video map graphic design, and studying new technologies for video discs. Author (GRA)

N85-10326# IBM Research Lab., San Jose, Calif.
A DETERMINATION OF THE PHOTOCHEMICAL QUANTUM YIELDS FROM 2 EXCITED TRIPLET STATES OF BIACETYL USING HOLOGRAPHY
R. K. Grygier, P. A. Brugger, and D. M. Burland 10 Aug. 1984 30 p
(Contract N00014-81-C-0418)
(AD-A145091; TR-7) Avail: NTIS HC A03/MF A01 CSCL 07/5

A holographic technique has been used to measure the quantum yield for photochemical product formation from two excited triplet states of biacetyl in a polymer host. The technique involves a simple measurement of the time taken for the hologram to reach its maximum diffraction efficiency. This measured time can be directly related to a photochemical quantum yield. GRA

N85-10327# Department of the Air Force, Washington, D.C.
RADIO FREQUENCY PROBING APPARATUS FOR SURFACE ACOUSTIC WAVE DEVICES Patent Application
F. Cho, M. D. Adamo, and D. E. LeSon, inventors (to Air Force) Filed 4 May 1984 32 p
(AD-D011230; US-Patent-Appl-SN-607087) Avail: NTIS HC A03/MF A01 CSCL 14/2

Wafer probing apparatus especially adapted to probing surface acoustic wave (SAW) device die such as delay lines is disclosed: the apparatus includes a probe card especially suited to the radio frequency and multiple output nature of a SAW delay line together with a computer-aided electronic system for exciting the delay line and evaluating its output. Author (GRA)

N85-10328# Department of the Air Force, Washington, D.C.
RADIATION MEASURING SYSTEM USING TRANSISTOR FLUX SENSORS Patent Application
V. Josephson, inventor (to Air Force) Filed 11 Jun. 1984 34 p
(AD-D011239; US-Patent-Appl-SN-619240) Avail: NTIS HC A03/MF A01 CSCL 06/18

The document describes an ionizing radiation intensity dosimeter apparatus and method based on carrier recombination saturation times for irradiated PN junction semiconductor devices following termination of a radiation pulse. Normally on quisecent condition, moderate radiation doses at relatively high dose rates, and a read-out arrangement employing qated burst counting are included. Author (GRA)

N85-10329# Department of Energy, Washington, D. C.
INDUCTION VOIDMETER Patent Application
Thomas T. Anderson, Conard J. Roop, Kenneth J. Schmidt, and John Brewer, inventors (to DOE) Filed 21 Dec. 1983 12 p
(Contract W-31-109-eng-38)
(DE84-014321; US-Patent-Appl-SN-564129) Avail: NTIS HC A02/MF A01

An induction voidmeter for detecting voids in a conductive fluid such as liquid sodium is disclosed. The device may comprise: a four arm bridge circuit having two adjustable circuit elements connected as opposite arms of the bridge, an input branch, and an output branch; two induction coils, bifilarly wound together, connected as the remaining two opposing arms of the bridge circuit and positioned such that the conductive fluid passes through the coils; means for applying an ac excitation signal to input branch; and means for detecting the output signal generated in response to the excitation signal across the output branch. The induction coils may be located outside or inside a nonmagnetic pipe containing the conductive fluid. DOE

N85-10330# Department of Energy, Washington, D. C.
ACOUSTIC EMISSION LINEAR PULSE HOLOGRAPHY Patent Application
H. D. Collins, L. J. Busse, and D. K. Lemon, inventors (to DOE) Filed 25 Oct. 1983 23 p
(Contract DE-AC06-76RL-01830)
(DE84-014519; US-Patent-Appl-SN-545426) Avail: NTIS HC A02/MF A01

A device which performs acoustic emission linear pulse holography, which combines the advantages of linear holographic imaging and acoustic emission into a single nondestructive inspection system is discussed. This system produces a chronological, linear holographic image of a flaw by utilizing the acoustic energy emitted during crack growth. The innovation is the concept of utilizing the crack generated acoustic emission energy to generate a chronological series of images of a growing crack by applying linear, pulse holographic processing to the acoustic emission data. The process is implemented by placing on a structure an array of piezoelectric sensors near the defect location. A reference sensor is placed between the defect and the array. DOE

N85-10331# Sandia Labs., Albuquerque, N. Mex.
MOTION SENSOR EVALUATION USING SIMULATION
J. D. Schmutz, G. M. McNerney, and R. M. Workhoven 1984 7 p Presented at the 25th Ann. Meeting of the Inst. of Nucl. Mater. Management, Columbus, Ohio, 15 Jul. 1984
(Contract DE-AC04-76DP-00789)
(DE84-014989; SAND-84-0539C; CONF-840734-8) Avail: NTIS HC A02/MF A01

Thorough evaluation testing of interior motion sensors which requires repeated testing under a variety of environmental conditions is outlined. Although the sensors are intended primarily for interior installations, many of the buildings where protection may be required are warehouses or bunkers without environmental control. To evaluate sensors for such installations, it is important to collect data on coverage or sensitivity at room temperature and at environmental extremes. A system designed and built to provide repeatability in environmental testing is described. The system is dubbed sandia intruder motion simulator (SIMS). This system is used to acquire much of the data now collected on sensors in the laboratory and a duplicate system has been delivered to the Belvoir R and D center so that the laboratory can now run similar tests. DOE

N85-10332# Max-Planck-Inst. fuer Physik und Astrophysik, Munich (West Germany). Werner-Heisenberg-Inst. fuer Physik.
A CONCEPT FOR A HADRON CALORIMETER WITH PHOTODIODE READOUT
H. Dietl, G. Eigen, V. Fonseca (Universidad Complutense, Madrid), E. Lorenz, and G. Mageras Jun. 1984 23 p refs Presented at Seminar on Perspectives for Exptl. Apparatus at Future High Energy Machines, Florence, 21-25 May 1984
(MPI-PAE/Exp-E1-130) Avail: NTIS HC A02/MF A01

Advantages and disadvantages of tower structure hadron calorimeters are described. The photodiode readout conserves the high energy resolution of a scintillator sandwich calorimeter but allows technical improvements. Advantages are: operation in magnetic fields; compactness; easy fabrication; high modularity; high safety, and no short term drift and high long term stability limited by radiation damage and scintillator aging. Disadvantages are: limited possibility to insert muon tracking chambers; poor energy resolution at the low energy end; and reduced repetition rate for optimal energy resolution in the medium energy range. Author (ESA)

N85-10333# Max-Planck-Inst. fuer Physik und Astrophysik, Munich (West Germany). Inst. fuer Physik.
IMPROVEMENTS IN PHOTODIODE READOUT FOR SMALL CsI (T1) CRYSTALS
H. Grassmann (Erlangen-Nurenburg University, West Germany), H. G. Moser (Erlangen-Nurenburg University, West Germany), H. Dietl, G. Eigen, V. Fonseca (Universidad Complutense, Madrid), E. Lorenz, and G. Mageras Jun. 1984 9 p refs Sponsored by Bundesministerium fuer Forschung und Technologie
(MPI-PAE/Exp-E1-131) Avail: NTIS HC A02/MF A01

Measurements of photon energy resolution in the region around 1 MeV with a small CsI(T1) photodiode detector are discussed. Resolution measurements demonstrate that the photodiode is superior to photomultiplier readout above 1 MeV, partly due to the absence of drift in the photodiode system. Observed resolution above 1 MeV is inferior. This is partly attributed to nonuniform light collection. Counter drawbacks include long shaping time, which limits the rate. Also the photodiode acts itself as a nuclear counter with low detection efficiency. Author (ESA)

N85-10334# National Bureau of Standards, Washington, D.C. Center for Building Technology.
THE NBS TRI-DIRECTIONAL TEST FACILITY
Kyle Woodward and Frank Rankin May 1984 45 p
(PB84-217462; NBSIR-84-2879) Avail: NTIS HC A03/MF A01 CSCL 14B

A general description of a unique structural testing apparatus is presented. The apparatus is called the NBS Tri-directional Test Facility (NBS/TTF). The NBS/TTF can subject large structural elements to a wide variety of three dimensional loadings including both translations and rotations in three orthogonal directions. The facility is computer based with all aspects of data acquisition, reduction, and display coordinated and controlled by a minicomputer. The loads are applied by a closed loop hydraulic system having seven independently servo-controlled hydraulic actuators. Lateral forces of up to + or - 900 kilonewtons may be imposed on the test specimen in combination with vertical forces of up to + or - 1800 kilonewtons. GRA

N85-10335# National Bureau of Standards, Washington, D.C. Center for Applied Mathematics.
ECONOMIC MODEL OF CALIBRATION IMPROVEMENTS FOR AUTOMATIC TEST EQUIPMENT Final Report
Stephen F. Weber and Anne P. Hillstrom Apr. 1984 98 p refs
(PB84-217827; NBS/SP-673; LC-84-601027) Avail: NTIS HC A05/MF A01; also available SOD CSCL 14B

A model for measuring the benefits of improved accuracy in test equipment is described. The model permits calculation of the probability of accepting a unit under test (UUT) that is out of specifications and the probability of rejecting a UUT that is within specifications for alternative levels of test equipment accuracy. Accuracy is defined in terms of both the systematic and the random measurement error of the equipment. Other parameters that are taken into account by the model are the mean and variance of the UUT attribute of interest, the performance specifications of the UUT, and the test specifications which define acceptance and rejection in terms of test measurement results. GRA

N85-10336# National Bureau of Standards, Boulder, Colo. Fracture and Deformation Div.
ELECTROMAGNETIC-ACOUSTIC-TRANSDUCER PERTURE SYSTEM FOR THICK-WELD INSPECTION Final Report, 1 Jul. 1981 - 31 Dec. 1983
C. M. Fortunko, R. E. Schramm, J. C. Moulder, and J. D. McColskey May 1984 123 p refs Sponsored in part by Ames Lab.
(PB84-219492; NBS-TN-1075) Avail: NTIS HC A06/MF A01; also available SOD CSCL 14B

A system is described based on electromagnetic acoustic transducers (EMATs) as an approach to automated nondestructive evaluation of thick weldments. Applications include a new type of ultrasonic inspection system for thick, butt welds used in ship construction. A minicomputer controlled transducer positioned and acquired the digitized ultrasonic waveforms for synthetic aperture processing. The synthetic aperture technique further improved signal quality and yielded flaw localization through the weld thickness. Details include the design of the transducers and electronics, as well as the mechanical positioner, signal processing algorithms, and complete computer program listings. GRA

N85-10337# National Bureau of Standards, Washington, D.C.
RADC/NBS (ROME AIR DEVELOPMENT CENTER/NATIONAL BUREAU OF STANDARDS) WORKSHOP. MOISTURE MEASUREMENT AND CONTROL FOR SEMICONDUCTOR DEVICES, 3
Benjamin A. Moore, ed. and Stanley Ruthberg, ed. May 1984 329 p refs Workshop held in Gaithersburg, Md., 2-4 Nov. 1983 Sponsored in part by RADC
(PB84-219559; NBSIR-84-2852) Avail: NTIS HC A15/MF A01 CSCL 14B

Measurement problems in integrated circuit processing and assembly, and control of moisture in hermetically packaged semiconductor devices were examined. Thirty-four presentations are included which contain detailed information for securing hermetic packages with low moisture content. Agreement in measurement was obtained with the mass spectrometer for cerdip and metal packages at the 5000 ppmv level of moisture through the use of suitable moisture generators, a 3-volume calibrator, calibrated dewpoint hygrometers, and appropriate operational procedures. An approach is given for a reproducible and reliable transfer package. However, the increased use of organic materials in new and rapidly expanding technologies such as VLSI/VHSIC and hybrid packaging presents new and more complex challenges to accurate measurement of interior moisture. GRA

N85-10338# National Bureau of Standards, Washington, D.C. Statistical Engineering Div.
MEASUREMENT ASSURANCE PROGRAMS. PART 2: DEVELOPMENT AND IMPLEMENTATION Final Report
Carroll Croarkin Apr. 1984 128 p refs 2 Vol.
(PB84-217876; NBS/SP-676-2-Pt-2; LC-84-601030-Pt-2) Avail: NTIS HC A07/MF A01; also available SOD CSCL 14B

This document is a guide to the logical development of a measurement assurance program in which the tie between a measurement and its reference base is satisfied by measurements on a transfer standard. The uncertainty of values reported by the measurement process is defined; and the validation of this uncertainty for single measurements is developed. Measurement sequences for executing the transfer with NBS and procedures for mantaining statistical control are outlined for eight specific measurement situations with emphasis on characterizing parameters of the measurement process through use of a check standard. Author (GRA)

N85-10339# National Bureau of Standards, Washington, D.C. Office of Physical Measurement Services.
MEASUREMENT ASSURANCE PROGRAMS. PART 1: GENERAL INTRODUCTION Final Report
Brian Belanger May 1984 74 p refs 2 Vol.
(PB84-217868; NBS/SP-676-1-Pt-1; LC-84-601030-Pt-1) Avail: NTIS HC A04/MF A01; also available SOD CSCL 14B

This publication is Part 1 of a two part guide describing NBS Measurement Assurance Program (MAP) Services and how to use them for measurement quality control. Part 1 describes the general philosophy of MAP Services and how they are used; Part 2 (Development and Implementation, by C. Croarkin) describes the statistical tools used in MAPs. MAPs constitute a more rigorous method for ascertaining and controlling measurement uncertainty than traditional NBS calibration services. GRA

36 LASERS AND MASERS

Includes parametric amplifiers.

N85-10340 Department of the Air Force, Washington, D.C.
SYNCHRONOUSLY PUMPED MODE-LOCKED SEMICONDUC-

TOR PLATELET LASER Patent
M. M. Salour and C. B. Roxlo, inventors (to Air Force) Issued 17 Jul. 1984 7 p Supersedes AD-D010039
(AD-D011214; US-Patent-4,461,006; US-Patent-Appl-SN-361019; US-Patent-Class-372-35) Avail: US Patent and Trademark Office CSCL 20/5

The document describes a synchronously pumped mode-locked semiconductor laser having an actively mode-locked optical pump source and an external resonant cavity. The resonant cavity is bounded by a pair of spaced-apart reflective elements. One of the reflective elements is partially transmissive and mounted for translational movement. The semiconductor crystal is mounted upon the other reflective element and both are mounted within a temperature controlled, vacuum environment while being capable of being moved in three dimensions. Appropriate laser pumping and adjustment of the translational movement of one of the reflective elements of the laser produces an output from the laser in the form of pulses of electromagnetic energy.
Author (GRA)

N85-10341 Department of the Air Force, Washington, D.C.
TUNABLE CW SEMICONDUCTOR PLATELET LASER Patent
M. M. Salour, C. B. Roxlo, and D. Bebelaar, inventors (to Air Force) Issued 24 Jul. 1984 7 p Supersedes AD-D010038
(AD-D011215; US-Patent-4,462,103; US-Patent-Appl-SN-361021; US-Patent-Class-372-35) Avail: US Patent and Trademark Office CSCL 20/5

The document describes a tunable continuous wave semiconductor platelet laser having an optical pump source and an external resonant cavity. The resonant cavity is bounded by a pair of spaced-apart reflective elements and has a prism therein. One of the reflective elements is partially transmissive and rotatable about its vertical axis. The semiconductor platelet is mounted upon the other reflective element and both are mounted within a temperature controlled, vacuum environment while being capable of being moved in three dimensions. The prism located within the resonant cavity aids in laser tuning upon rotation of the partially transmissive reflective element. Author (GRA)

N85-10342*# National Aeronautics and Space Administration, Washington, D. C.
MANUAL FOR RAMAN CELLS
W. Mueckenheim Oct. 1984 35 p Transl. into ENGLISH of "Manual fuer Ramanzellen: RS 75-1500 D, RS 75-1500 E, RS 75-140 D, RS 75-140 E, RS 75-4500 D, RS 75-9000 D" Goettingen, West Germany, 1983 33 p Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77756; NAS 1.15:77756) Avail: NTIS HC A03/MF A01 CSCL 20E

Characteristics of Raman cells offered by Lambda Physik are described, assembly and installation instructions are given, and conversion from one variant to another is explained. Author

N85-10343# Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
MATERIAL DEGRADATION IN HEAVY STEEL PLATES CAUSED BY BENDING WITH A LASER M.S. Thesis
D. L. Deacon Jun. 1984 110 p
(Contract N66314-70-A-0073)
(AD-A144784) Avail: NTIS HC A06/MF A01 CSCL 20/5

A new process for bending heavy steel plates, using a laser to supply line heat, is described. A set of samples bent by this method was examined for metallurgical damage. Metallographic examination revealed problems of grain growth and carbide segregation. Hardness measurements led to the conclusion that the heat affected zone is being transformed into untempered martensite. Microprobe analysis indicated a loss of nickel to carbide segregation. Charpy V-notch tests indicated a loss of ductility in the heat affected zone. The extent of damage was found to be a function of the surface temperature produced by the laser. A multiple-pass procedure was found to do much less damage than a single-pass procedure for an equivalent degree of bend. GRA

N85-10344# Air Force Weapons Lab., Kirtland AFB, N. Mex.
EXPERIMENTAL PROPERTIES OF AN INHOMOGENEOUSLY BROADENED He-Xe UNSTABLE RING LASER Final Report, Oct. 1981 - Dec. 1983
Y. M. Liu Jul. 1984 59 p
(AF Proj. ILIR)
(AD-A144824; AFWL-TR-84-30) Avail: NTIS HC A04/MF A01 CSCL 20/5

Although the ring resonator has been previously investigated in several ways, the unstable ring resonator with inhomogeneously broadened gain medium is not yet well understood. The objective of this thesis is to explore reverse mode suppression in an unstable ring resonator by using a helium-xenon (He-Xe) gas mixture which is inhomogeneously broadened. The optical feedback technique employing a suppressor mirror was used. Several aspects of the unstable ring resonator are discussed: the relative power levels in forward and reverse waves, with and without the suppressor mirror, with strong and weak couplings from reverse wave to forward wave; the near field and far field patterns; and the mode volume effect. The degree of suppression in the reverse wave and the degree of increase in the forward wave, when the suppressor mirror was in place, are also discussed. Author (GRA)

N85-10345# Naval Research Lab., Washington, D. C.
SHIPBOARD MEASUREMENT OF CLOUD BASES AND AVERAGE SURFACE VISIBILITY WITH AN EYE-SAFE LIDAR Interim Report
W. P. Hooper 9 Aug. 1984 19 p
(AD-A144889; AD-E000589; NRL-8819) Avail: NTIS HC A02/MF A01 CSCL 20/5

An eye safe lidar, originally built by a Navy contractor, has been modified by the Naval Research Laboratory and evaluated at sea. The instrument operated in the severest weather encountered a moderate gale. Cloud bases below 2 km and visibilities less than 10 km were measured. Improvements are needed to reduce sky noise and increase receiver sensitivity, but the system is surprisingly resistant to ocean spray and shipboard vibration.
GRA

N85-10346# International Business Machines Corp., San Jose, Calif. Research Lab.
TIME RESOLVED CALORIMETRY OF 30 nm Te-FILMS DURING LASER ANNEALING
H. Coufal and W. Lee 10 Aug. 1984 7 p
(Contract N00014-81-C-0418)
(AD-A145047; TR-8) Avail: NTIS HC A02/MF A01 CSCL 20/13

The temperature of 30 nm thick Te-films has been studied during annealing with a XeCl Excimer laser. Using a pyroelectric thin film calorimeter melting, boiling and recrystallization were observed. Boiling was identified as the prevalent mechanism for the loss of material. Author (GRA)

N85-10347# KM Sciences, Arlington, Va.
NRL (NAVAL RESEARCH LABORATORY) FEL (FREE ELECTRON LASER) PROGRAM Final Report, 29 Dec. 1982 - 29 Jun. 1984
29 Jun. 1984 35 p
(Contract N00014-83-C-2042)
(AD-A145057; AD-F300453) Avail: NTIS HC A03/MF A01 CSCL 20/5

The Naval Research Laboratory (NRL) Free Electron Laser (FEL) program proposed to use the NRL Electron Linear Accelerator as a source of relativistic electrons for its studies. Previous work by KM Sciences had concentrated on the evaluation of the upgrades needed on the entire facility to meet the needs of the FEL program. These had included injection electronics, injection hardware, accelerating structures, beam transport alignment, and the required additional deflection systems. The continuing work reported herein focuses on the design of a new injection system, beam quality evaluation, and on the design of an energy and phase analysis system for the resultant electron beam. A comput-

er ray-tracing program describing the interaction of the electron beam with the FEL wiggler structure will also be discussed. GRA

N85-10348# Flow Research, Inc., Kent, Wash.
THE DEVELOPMENT OF A DIODE LASER DOPPLER VELOCIMETER FOR BOUNDARY LAYER MEASUREMENTS UNDER ICE: A FEASIBILITY INVESTIGATION Final Report, 26 Sep. 1983 - 25 Mar. 1984
J. C. Schedvin and H. T. Liu May 1984 57 p
(Contract N00014-83-C-0764)
(AD-A145076; TR-290) Avail: NTIS HC A04/MF A01 CSCL 20/5

Measurements of the turbulent fluxes of momentum, heat, and salinity in the oceanic boundary layer are difficult to obtain, as both a stable platform and high-resolution instrumentation are required. The overall objective of the present investigation was to develop a boundary layer instrumentation system capable of measuring turbulent fluxes in the marginal ice zone environment. This investigation focuses on a feasibility study toward development of a diode laser Doppler velocimeter (DLDV) to be used as the velocity sensor for a high-resolution velocity/temperature/conductivity cluster, with a spatial resolution of 1 to 2 cm. Phase 1 findings show very promising results for the DLDV in laboratory environments. Measurements in a pipe flow facility demonstrated very distinctive Doppler burst signals, with more than adequate signal-to-noise ratio, even in clean tap water passed through a 10 micrometer filter. Excellent burst density was observed when a small quantity of Puget Sound water was added to the tap water. For all practical purposes, the performance of the DLDV is at least as good as that of a well-established LDV system using a helium-neon laser as the light source. GRA

N85-10349# California Univ., Santa Barbara. Dept. of Physics.
FREE ELECTRON LASERS Final Technical Report, 1 Jan. - 1 Dec. 1983
W. B. Colson 1 Dec. 1983 11 p
(Contract F49620-83-C-0043)
(AD-A145109; AFOSR-84-0737TR) Avail: NTIS HC A02/MF A01 CSCL 20/5

Further support of the LANL experiment and the strong-field synchrotron instability has used the periodic window for optical mode analysis. Using the LANL parameters current and magnetic field strength, the effect of the resonator on mode stability was examined. It was found that as much as 20% loss/pass was necessary for the FEL to run without sidebands. When the losses were dropped to 14% pass, a single sideband appeared in the untapered FEL planned at LANL. When the losses were lowered to 1% (as eventually planned), the optical field became chaotic and the FEL went broad band. Author (GRA)

N85-10350# Naval Research Lab., Washington, D. C.
FLIGHT DEMONSTRATION OF NEW NRL REAL-TIME DATA ACQUISITION SYSTEM AND LASER VIDEO WAVEFORM SAMPLER
C. S. Lin, E. A. Uliana, and D. L. Hammond 3 Sep. 1984 16 p
(AD-A145126; NRL-MR-5396) Avail: NTIS HC A02/MF A01 CSCL 09/2

A new NRL Laser Video Waveform Sampler and Real-Time Data Acquisition System were installed in a RP-3A aircraft and data were obtained in a test flight over the Great Dismal Swamp area on 28 June 1982. The data are in time amplitude pairs, which give both range and reflectivity, and are stored on magnetic tape. The returns show reflections from various levels of the canopy. The results show that it is possible to profile a complicated terrain in order to determine the vegetation and undergrowth height and the relative reflectivities of the various surface. Author (GRA)

N85-10351# Department of the Army, Washington, D. C.
FREQUENCY STABILIZED LASER Patent Application
R. J. Mongeon and R. W. Henschke, inventors (to Army) Filed 10 Aug. 1984 13 p
(AD-D011223; US-Patent-Appl-SN-639558) Avail: NTIS HC A02/MF A01 CSCL 20/5

The document describes a frequency control system for a laser for compensating for thermally-induced laser resonator length changes. The frequency control loop comprises a frequency reference for producing an error signal and electrical means to move a length-controlling transducer in response thereto. The transducer has one of the laser mirrors attached thereto. The effective travel of the transducer is multiplied severalfold by circuitry for sensing when the transducer is running out of extension and in response thereto rapidly moving the transducer and its attached mirror toward its midrange position. Author (GRA)

N85-10352# Los Alamos Scientific Lab., N. Mex.
DEVELOPMENT OF THE ANTARES ELECTRON GUN
R. Stine, W. Leland, C. Mansfield, L. Rosocha, J. Jansen, R. Gibson, and G. Allen 1984 5 p refs Presented at 11th Intern. Symp. on Discharges and Elec. Insulation in Vacuum, Berlin, 24 Sep. 1984
(Contract W-7405-eng-36)
(DE84-014043; LA-UR-84-1939; CONF-840981-2) Avail: NTIS HC A02/MF A01

A CO2 laser system is described. This laser system is developed for the Intertial Confinement Fusion (ICF) program and is beginning target experiments. The distributed circuit modeling, design and operation of the large electron gun developed for the final laser power amplifier are reviewed. This gun is significant because of the large electron current area, 9 m(2); the number of emitter blades, 48; the dual cathode current return; and the coaxial geometry and grid control. The gun components and their development are discussed. These include the emitter blades, the coaxial grid (to maintain constant electron current during the 5-(MU)s pulse), the bonded stacked ring insulator (to electrically insulate the grid/cathode), the Kapton/aluminum electron transmission windows (to provide an interface between gun vacuum and laser gas) and the vacuum shell (operated at a vacuum of 10(-6) torr). A unique pressure diagnostic is also discussed. DOE

N85-10353# Fondazione Ugo Bordoni, Rome (Italy).
HIGH FREQUENCY PHASE-NOISE IN SEMICONDUCTOR LASERS
Paolo Spano Jul. 1983 6 p refs Presented at 9th European Conf. on Opt. Commun., Geneva, 23-26 Oct. 1983
(FUB-20-1983) Avail: NTIS HC A02/MF A01

Phase noise in GaAlAs lasers operating in a single longitudinal mode is discussed. The use of short cavities reduces frequency noise over the whole band, suppressing the resonance peak of the laser, when the values of a reference parameter associated to the amplitude of the feedback field and to the round trip time in the external cavity are kept near the maximum allowed value. Author (ESA)

N85-10784# Joint Publications Research Service, Arlington, Va.
ACHIEVEMENTS IN LASER DEVELOPMENT
Stefka Popova *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-84-029) 3 Aug. 1984 p 1-5 Transl. into ENGLISH from Pogled (Sofia), 18 Jun. 1984 p 1, 5 (For primary document see N85-10783 01-70)
Avail: NTIS HC A03/MF A01

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N85-10354# Loughborough Univ. of Technology (England). Dept. of Transport Technology.
CYLINDER POWER FAULT DIAGNOSIS IN MILITARY DIESEL ENGINES Progress Report
J. W. Freestone and E. G. Jenkins Aug. 1984 106 p refs
(TT-8405) Avail: NTIS HC A06/MF A01

The detection and identification of individual cylinders with power faults in multi-cylinder diesel engines is an important

requirement of condition monitoring equipment for military vehicles and naval vessels. A technique for assessing the power contribution of each cylinder in a six-cylinder in-line turbocharged diesel engine from the measurement of engine need fluctuations is described. Robust magnetic transducers are used to sense the flywheel speed under steady-state no-load conditions; the transducer signal is conditioned and converted to digital form for processing by microcomputer. Forward and inverse discrete Fourier transforms are used to process the speed data to estimate the crankshaft gas-pressure torque from which the performance of each cylinder is assessed. Author

N85-10355*# Texas A&M Univ., College Station. Dept. of Mechanical Engineering.
ROTORDYNAMIC ANALYSIS OF THE SSME TURBOPUMPS USING REDUCED MODELS
Sherif T. Noah Sep. 1984 72 p refs
(Contract NAS8-34505)
(NASA-CR-171170; NAS 1.26:171170) Avail: NTIS HC A04/MF A01 CSCL 13K

Alternative methods for the rotor-dynamic and sensitivity analysis of large rotor systems are examined. The methods are assessed for their ability to utilize accurate models of reduced size along with effective procedures for describing the dynamic behavior of the systems. Frequency response-based techniques are developed for determining the steady state response to imbalance of the space shuttle main engine (SSME) turbopumps and the related eigenvalue problem. The rotor and housing are represented by reduced receptances associated with their coupling points. The housing may be described by all of its normal modes within a frequency range of interest. The effects of truncated higher and lower modes are accounted for in an approximate manner. A procedure is described for determining the sensitivity of the coupling forces to changes in the coupling elements and rotor speed of the turbopump systems. In addition, an eigenvalue sensitivity analysis technique is adopted for application to the systems. Computer programs were developed for the numerical implementation of the impedance and eigenvalue sensitivity formulated in this study. S.B.

N85-10356# Ruhr Univ., Bochum (West Germany). Inst. fuer Werkstoffe.
STRUCTURE AND WEAR WORKSHOP COLLOQUIUM [WERKSTOFF-KOLLOQUIUM: GEFUEGE UND VERSCHLEISS]
1984 61 p refs Partly in GERMAN and ENGLISH Colloq. held at Bochum, West Ger., 14 Feb. 1984
Avail: NTIS HC A04/MF A01

The influence of carbide distribution on the abrasive wear rate of chromium steels, and the influence of surface layers on the friction and wear behavior of materials were investigated. Fretting corrosion and fretting fatigue of medium carbon steels were tested. Structure and abrasive wear resistance of iron based alloys rich in hardening components are discussed. Friction and wear behavior of polymers and polymer matrix composites; and friction, wear and structure of heterogeneous materials are treated. For individual titles, see N85-10357 through N85-10362.

N85-10357# Ruhr Univ., Bochum (West Germany).
THE INFLUENCE OF SURFACE LAYERS ON THE FRICTION AND WEAR BEHAVIOR OF MATERIALS [BEEINFLUSSUNG DES REIBUNGS- UND VERSCHLEISSVERHALTENS VON WERKSTOFFEN DURCH OBERFLAECHENSCHICHTEN]
K.-H. Habig *In its* Struct. and Wear Workshop Colloq. 1984 p 1-9 In GERMAN (For primary document see N85-10356 01-37)
Avail: NTIS HC A04/MF A01

Natural adsorption and reaction layers, and protective surface layers are treated. The behavior of surface layers during tribological loading under the influence of a reaction with an ambient medium, an intermediate substance, and antibody material is shown. The friction and wear behavior of thermochemically and tribochemically grown surface layers is shown. Author (ESA)

N85-10358# Max-Planck-Inst. fuer Eisenforschung, Duesseldorf (West Germany).
FRETTING CORROSION AND FRETTING FATIGUE OF MEDIUM CARBON STEELS
D. Duquette *In* Ruhr Univ. Struct. and Wear Workshop Colloq. 1984 p 10-18 (For primary document see N85-10356 01-37)
Avail: NTIS HC A04/MF A01

Fretting (cyclic wear) experiments were performed on a 0.4% C steel. The behavior as a function of alloy heat treatment, environment, and fretting variables was investigated. Analyses were made by optical and electron microscopy in order to obtain a model for material removal and enhanced fatigue crack initiation under fretting conditions. These phenomena are found to be basically mechanically induced. Previously reported temperature rises in fretted surfaces and evidence of classic wear phenomena are not observed. The model considers the fretting phenomenon to be of surface cyclic work hardening to a large extent, and the fretting fatigue and fretting corrosion processes to be closely related. Author (ESA)

N85-10359# Ruhr Univ., Bochum (West Germany).
THE INFLUENCE OF THE CARBIDE DISTRIBUTION ON THE ABRASIVE WEAR OF LEDEBURITIC CHROMIUM STEELS [EINFLUSS DER KARBIDVERTEILUNG AUF DEN ABRASIVEN VERSCHLEISS LEDEBURITISCHER CHROMSTAEHLE]
W. Trojahn *In its* Struct. and Wear Workshop Colloq. 1984 p 19-27 In GERMAN (For primary document see N85-10356 01-37)
Avail: NTIS HC A04/MF A01

The influence of carbide amount, type of carbide, and carbide distribution on the wear rate of chromium steels was investigated. In transformed steels the wear rate decreases with increasing carbide content. For approximately equal carbide contents cast steels and transformed steel show a decreasing wear rate for increasing carbide diameter. Electron microscope investigations show that a smaller carbide distance allows the penetration of abrasives into the surface only in carbide-free zones and hence reduces the wear rate. Author (ESA)

N85-10360# Ruhr Univ., Bochum (West Germany).
STRUCTURE AND ABRASIVE RESISTANCE OF IRON BASED ALLOYS RICH IN HARDENING COMPONENTS [GEFUEGE UND ABRASIVER VERSCHLEISSWIDERTSAND HARTSTOFF-FREICHER EISENBASISLEGIERUNGEN]
A. Fischer *In its* Struct. and Wear Workshop Colloq. 1984 p 28-42 In GERMAN (For primary document see N85-10356 01-37)
Avail: NTIS HC A04/MF A01

Structure and abrasive wear resistance of alloys Fe-30Cr-45C and Fe-20Cr-7Nb-5.5C were studied in order to develop ordered welding alloys and to optimize them with respect to welding behavior, wroughtability, and alloying costs. Criteria for the development of ordered welding alloys are given. The identification of hard components is discussed. The test results are listed. Author (ESA)

N85-10361# Ruhr Univ., Bochum (West Germany). Inst. fuer Werkstoffe.
FRICTION AND WEAR OF POLYMERS AND POLYMER COMPOSITE MATERIALS [REIBUNG UND VERSCHLEISS VON POLYMER- UND POLYMERVERBUNDWERKSTOFFEN]
U. Karsch *In its* Struct. and Wear Workshop Colloq. 1984 p 43-51 In GERMAN (For primary document see N85-10356 01-37)
Avail: NTIS HC A04/MF A01

Properties of polymers resulting from macromolecular structure, heat conductivity and mechanical characteristics (hardness), and the resulting friction and wear behavior are discussed for thermoplastic materials. Tribological behavior is determined by tests on the influence of morphology (polypropylene), the influence of the environment (polyamide and polyethylene), the correlation between friction and wear (polytetrafluoroethylene), and the friction behevior of aramide fibers in the composite. Volume part of the components, properties and adhesion of the components, and form and orientation (anisotropy) are considered. Author (ESA)

N85-10362# Ruhr Univ., Bochum (West Germany). Inst. fuer Werkstoffe.
FRICTION, WEAR AND STRUCTURE OF HETEROGENEOUS MATERIALS [REIBUNG, VERSCHLEISS UND GEFUEGE HETEROGENER WERKSTOFFE]
E. Hornbogen *In its* Struct. and Wear Workshop Colloq. 1984 p 52-59 refs In GERMAN (For primary document see N85-10356 01-37)
Avail: NTIS HC A04/MF A01

Materials science aspects of friction and wear of multiphase materials, including wear resistant steels, cast iron, sintering metals, and polymer based composite materials are discussed. The correlation between abrasive wear and material properties, especially the parameters of multiphase structures (volume part, surface part, structure type, structure anisotropy, boundary surface structure) is treated. Author (ESA)

N85-10363# Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
MEASUREMENT AND ANALYSIS OF SPARK IGNITION ENGINE PRESSURE DATA TO DETERMINE HEAT RELEASE PROFILES M.S. Thesis
F. E. Nelson Jun. 1984 93 p
(Contract N66314-70-A-0073)
(AD-A144770) Avail: NTIS HC A05/MF A01 CSCL 21/7

Heat release analysis can be computed from the measured cylinder pressure at known cylinder volumes through the use of the First Law Thermodynamics and the ideal gas law. After correcting for crevice effects and heat transfer to the combustion chamber walls, the combustion heat release profile can be determined. From the combustion heat release profile, the burn rate and the mass fraction burned can be calculated for studies of knock and turbulence. The Ricardo Hydra MK III engine is instrumented, the operating properties are checked and the cylinder pressure is measured for fired and motored operating conditions at six different load and speed setpoints. The generated pressure data is then used in the Sloan Automotive Lab heat release model to determine the validity of the model for real engine data. The model is checked for scaling by load and speed. The heat release was successfully modeled using one set of model parameters for this engine operating at the different loads and speeds.
Author (GRA)

N85-10364# Massachusetts Inst. of Tech., Cambridge.
COMBUSTION MODELING OF A 2 CYLINDER CYCLE RECIPROCATING ENGINE M.S. Thesis
V. Chrjapin Jun. 1984 94 p
(Contract N66314-70-A-0073)
(AD-A144782) Avail: NTIS HC A05/MF A01 CSCL 21/7

A simple mathematical model was developed to simulate the closed portion of the cycle for a quiescent chamber compression ignition engine using the assumption of perfect gases and the first law of thermodynamics. Various input parameters were used in trend analysis to check the model. The output from the computer program was compared to test data from a four inch bore, open chamber semi quiescent diesel engine run at the Sloan Test Laboratory. This computer model was then modified to simulate the expansion stroke of a newly developed, two cylinder cycle reciprocating engine. The model was then run to determine the optimum point of fuel injection for the new engine. GRA

N85-10365# Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
UTILITY OF THE M.I.T. (MASSACHUSETTS INSTITUTE OF TECHNOLOGY) UNDERWATER STUD WELDING GUN M.S. Thesis
H. L. Pruitt, Jr. Jun. 1984 118 p
(Contract N66314-70-A-0073)
(AD-A144793) Avail: NTIS HC A06/MF A01 CSCL 13/5

A study was undertaken to determine tasks which could reasonably be undertaken by the M.I.T. underwater stud welding gun. During the study it was determined that many tasks either would require special apparatus, or the use of such apparatus would greatly reduce the complexity of the tasks, thereby reducing the required time as well as increasing the quality of the tasks performed. Lifting and turning padeye mounting, A-frame mounting, patching, marking, zinc replacement, hot tap mounting, shoring, cofferdam construction, jacking gear attachment, air lock attachment and space welding are the tasks that have been defined. Special templates, gaskets, gasket/templates, manipulator configurations, and pre-packaged stud welding boxes were designed to accommodate the defined tasks. In order to appraise the utility of the underwater stud welding gun, special tasks and a means by which to evaluate the quality of the tasks performed have been selected. The author has hypothesized that use of the M.I.T. underwater stud welding gun will not only reduce the time required to complete the selected tasks, but also expand the environment of task accomplishment into conditions which presently are prohibitive. GRA

N85-10366# Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
PREDICTED HEAT TRANSFER LOSS IN THE EXPANSION CYLINDER OF A 2 CYLINDER RECIPROCATING ENGINE M.S. Thesis
P. C. Jorgensen May 1984 119 p
(Contract N66314-70-A-0073)
(AD-A144831) Avail: NTIS HC A06/MF A01 CSCL 21/5

Carmichael has proposed a direct injection, temperature ignition (TI), reciprocating engine design which divides the conventional four stroke cycle functions between a compression cylinder and an expansion cylinder, interconnected by a static regenerative heat exchanger. The prediction of heat transfer loss in the expansion cylinder is required to predict the performance of the new cycle. Woschni's correlations developed for direct injection, quiescent, four stroke, compression ignition (CI) engines, are used to predict uncorrelated expansion cylinder heat transfer loss. Laws of similarity allow, in principle, extrapolation outside the experimental data range for forced convection heat transfer only. General applicability of Woschni's correlations is established by examining the expansion cylinder quiescent condition, using predicted mean gas velocity magnitudes and fully developed, turbulent flow, forced convection models. Predicted radiant peak flame emissivity and temperature are found and compared with nominal peak values observed in conventional CI engine cycles to establish a minimum radiation flux reduction ratio. A mean reduction ratio for forced convection flux is also found. A corrected, conservative prediction of heat transfer loss in the expansion cylinder is then established. GRA

N85-10367# Department of Energy, Washington, D. C.
COLLAPSABLE SEAL MEMBER Patent Application
Dennis L. Sherrell, inventor (to DOE) Filed 8 Dec. 1983 14 p
(Contract DE-AC06-76FF-02170)
(DE84-014300; US-Patent-Appl-SN-559508) Avail: NTIS HC A02/MF A01

A hollow, collapsable seal member normally disposed in a natural expanded state offering fail-safe pressure sealing against a seating surface and adapted to be evacuated by a vacuum force for collapsing the seal member to disengage the same from said seating surface is described. DOE

N85-10368# Technical Research Centre of Finland, Espoo. Metals Lab.
OPTICAL SEAM TRACKING OF ROBOTIC ARC WELDING
Kari Koskinen, Hannu Lehtinen, and Karri Vartiainen Mar. 1984 53 p refs In FINNISH; ENGLISH summary
(VTT-272; ISBN-951-38-1999-X; ISSN-0358-5077) Copyright. Avail: NTIS HC A04/MF A01; Technical Research Centre of Finland, Espoo FIM 25

An optical system that locates the welding head above different types of seams, finds the starting point, controls the welding according to gap width, and guides a robot along weld paths is described. The image acquisition system is fixed to the coordinate system moving with the weld head. A laser light source and fiber optic transducers are used. The system was tested in realistic

workshop conditions. The imaging system and noise levels are satisfactory. Author (ESA)

N85-10369# Mechanical Technology, Inc., Latham, N. Y.
FREE-PISTON STIRLING ENGINE DEVELOPMENT Annual Report, 1 Dec. 1982 - 31 Dec. 1983
Thomas J. Marusak and Ted Gilles (Lennox Industries) Apr. 1984 131 p
(PB84-237767; MTI-84FPSE23; GRI-84/0074) Avail: NTIS HC A07/MF A01 CSCL 13A

The Free-Piston Stirling Engine (FPSE) is an important prime mover option in developing a viable gas-fueled heat pump for residential applications. The Stirling engine, while potentially attractive from a performace, life, and cost standpoint, is on a long-term development track. Improving engine performance and reliability have progressed. The engine development is being funded by the Gas Research Institute, with the main technical goal of integrating the most advanced, reliable sytem components into a prototype FPSE heat pump module for laboratory testing and evaluation. Development of the compressor for the FPSE-driven heat pump is being supported by a coordinated and parallel DOE-sponsored program. GRA

N85-10370# General Electric Co., Schenectady, N. Y.
MINOR ELEMENT EFFECTS ON GAS TUNGSTEN ARC WELD PENETRATION Interim Report, 1 Oct. 1982 - 30 Sep. 1983
R. E. Sundell, W. F. Savage (Rensselaer Polytechnic Inst.), H. D. Solomon, L. P. Harris, L. A. Wojcik, and D. W. Walsh (Rensselaer Polytechnic Inst.) Dec. 1983 60 p refs
(PB84-222579; SRD-83/006; NSF/MEA-83024) Avail: NTIS HC A04/MF A01 CSCL 13H

Work undertaken to investigate and develop a way to control the influence of minor element concentrations on gas tungsten arc (GTA) weld penetration is summarized. Progress is reported on three tasks: weld penetration control, weld pool flow, and arc physics modeling. The computer program used to calculate surface tension is provided. Four calculations of surface tension are included. Author (GRA)

N85-10123# Joint Publications Research Service, Arlington, Va.
SUPPRESSING POROSITY IN WELD JOINTS OF 1420 ALUMINUM ALLOY Abstract Only
M. A. Abralov, R. U. Abdurakhmanov, N. G. Kartyshov, A. A. Abdurakhimov, R. M. Saidov, M. A. Polezhayev, and F. R. Kulkov *In its* USSR Rept.: Mater. Sci. and Met., No. 93 (JPRS-84810) 25 Nov. 1983 p 36 Transl. into ENGLISH from Svarochnoye Proizv. (Moscow), no. 7, Jul. 1983 p 36-38 (For primary document see N85-10110 01-23)
Avail: NTIS HC A04

N85-10124# Joint Publications Research Service, Arlington, Va.
EFFECT OF WELDING METHOD ON CORROSION RESISTANCE OF WELDED COMPOSITIONS MADE OF 1201 ALLOY Abstract Only
N. A. Pashina, L. Ye. Ivanova, and G. S. Ustinova *In its* USSR Rept.: Mater. Sci. and Met., No. 93 (JPRS-84810) 25 Nov. 1983 p 36-37 Transl. into ENGLISH from Svarochnoye Proizv. (Moscow), no. 7, Jul. 1983 p 34-35 (For primary document see N85-10110 01-23)
Avail: NTIS HC A04

N85-10215# Joint Publications Research Service, Arlington, Va.
REPORT ON HIGH-PRECISION JIG-BORING MACHINES
L. M. Kordysh *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-84-019) 30 Oct. 1984 p 11-14 Transl. into ENGLISH from Soviet Export (Moscow), v. 150, no. 3, 1984 p 40-41 (For primary document see N85-10214 01-31)
Avail: NTIS HC A03

N85-10217# Joint Publications Research Service, Arlington, Va.
GROWTH, FUTURE OF SOVIET ROBOTICS SECTOR ANALYZED
Viktor Gerasimov and Nikolay Petrov *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-84-019) 30 Oct. 1984 p 20-40 Transl. into ENGLISH from Zynamya (Moscow), no. 8, Aug. 1984 p 161-176 (For primary document see N85-10214 01-31)
Avail: NTIS HC A03

N85-10397*# Texas Univ., Austin.
NUMERICAL ANALYSIS OF SOME PROBLEMS RELATED TO THE MECHANICS OF PNEUMATIC TIRES: FINITE DEFORMATION/ROLLING CONTACT OF A VISCOELASTIC CYLINDER AND FINITE DEFORMATION OF CORD-REINFORCED RUBBER COMPOSITES
J. Tinsley Oden, Eric B. Becker, T. L. Lin, and K. T. Hsieh *In* NASA. Langley Research Center Res. in Struct. and Dyn., 1984 Oct. 1984 p 297-314 refs (For primary document see N85-10377 01-39)
(Contract NAS1-17359)
Avail: NTIS HC A18/MF A01 CSCL 20K

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N85-10371*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ULTRASONIC NONDESTRUCTIVE EVALUATION, MICROSTRUCTURE, AND MECHANICAL PROPERTY INTERRELATIONS
Alex Vary Washington Oct. 1984 30 p refs
(NASA-TM-86876; E-2337; NAS 1.15:86876) Avail: NTIS HC A03/MF A01 CSCL 14D

Ultrasonic techniques for mechanical property characterizations are reviewed and conceptual models are advanced for explaining and interpreting the empirically based results. At present, the technology is generally empirically based and is emerging from the research laboratory. Advancement of the technology will require establishment of theoretical foundations for the experimentally observed interrelations among ultrasonic measurements, mechanical properties, and microstructure. Conceptual models are applied to ultrasonic assessment of fracture toughness to illustrate an approach for predicting correlations found among ultrasonic measurements, microstructure, and mechanical properties. R.S.F.

N85-10372# LTV Aerospace Corp., Dallas, Tex. Aero Products Div.
ICAM (INTEGRATED COMPUTER AIDED MANUFACTURING) CONCEPTUAL DESIGN FOR COMPUTER-INTEGRATED MANUFACTURING. VOLUME 4, PART 6: TASK D. QUALITY ASSURANCE/QUALITY CONTROL/TECHNICAL REQUIREMENT/TASKS, QUALITY ASSURANCE MODELING AND ANALYSIS, QUALITY ASSURANCE PROGRAM MANAGEMENT STANDARD RECOMMENDATIONS (ISP) Final Technical Report, 1 Oct. 1981 - 29 Jun. 1984
R. H. Wettach, B. R. Shepherd, and W. D. Vinson Wright-Patterson AFB, Ohio AFWAL 29 Jun. 1984 304 p
(Contract F33615-81-C-5119)
(AD-A144891; Rept-2-20150/4R-2-Vol-4-Pt-6; ISP110513000-Vol-4-Pt-6; AFWAL-TR-84-4020-Vol-4-6) Avail: NTIS HC A14/MF A01 CSCL 14/4

This document, Vol. IV, Part 6, of the Final Technical Report contains the Quality Assurance Program Management Standard Recommendations (ISP). This document presents recommendations for a new DoD Quality Assurance Standard and two alternative considerations for improving existing standards. Background rationale and other supporting material, including analysis approach and survey results are presented. Author (GRA)

N85-10373# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
EFFECT OF PENETRANT ON FATIGUE OF ALUMINUM ALLOY

LAP JOINTS
H. J. Kolkman 1 Jul. 1982 20 p refs
(Contract NIVR-1725)
(NLR-TR-82104-U) Avail: NTIS HC A02/MF A01

The effect of penetrant on the fatigue life of single shear riveted lap joints was investigated by flight simulation fatigue tests using the MINITWIST gust spectrum. The penetrant/material combination investigated was ARDROX 985 P3T and aluminum alloy 2024-T3 sheet material (both bare and clad). The effect of penetrant on the fatigue life is positive. Author (ESA)

N85-10374# Atomic Energy Research Establishment, Harwell (England). Materials Physics Div.
ULTRASONIC SYNTHETIC APERTURE FOCUSING USING UNFOCUSED PULSE-ECHO TRANSDUCERS
S. F. Burch and J. T. Burton Mar. 1984 26 p refs
(AERE-R-11230) Avail: NTIS HC A03/MF A01

The lateral resolution of digital data from the unfocused pulse-echo transducers used in conventional ultrasonic inspections can be improved using the synthetic aperture focusing technique (SAFT). For practical applications it is important to minimise the level of sidelobes (artefacts) introduced by SAFT, without significant loss of resolution. This may be achieved by the inclusion of a suitable aperture weighting function in the SAFT algorithm, combined with a synthetic aperture size related to the width of the transducer beam-spread. The properties of the resulting optimized SAFT algorithms are quantified using experimental data from a series of artificial flaws (slots) of different sizes. Author

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N85-10375 Prins Maurits Lab. TNO, Rijswijk (Netherlands).
MODEL STUDY OF THE INTERACTION OF A BLAST WAVE WITH THE SUPERSTRUCTURE OF SHIPS. PART 5: APPLICATION OF OPTICAL MEASUREMENT METHODS TO THE STUDY OF BLAST INTERACTION [MODELONDERZOEK NAAR DE UITWERKING VAN BLAST OP DE BOVENBOUW VAN SCHEPEN. DEEL V. TOEPASSING VAN OPTISCHE MEETMETHODEN T.B.V. ONDERZOEK BLAST INTERAKTIE]
J. C. M. Jasper Sep. 1983 77 p refs In DUTCH; ENGLISH summary
(Contract A75/KM/106)
(PML-1984-12-Pt-5; TDCK-79245-Pt-5) Copyright. Avail: Issuing Activity

Quantitative optical methods to study the interaction of a blast wave with an object, including the laser Schlieren technique and the differential interferometer are discussed. It is shown that the density profile in flow fields around a rectangular model can be determined with these methods. The shock waves accompanying the blast phenomenon are generally weak. The optical measurements are used to derive the pressure distribution at the wall of the model using the isentropic equation of state.
Author (ESA)

N85-10376*# Rocketdyne, Canoga Park, Calif. Materials Engineering and Technology.
RETARDATION ANALYTICAL MODEL TO EXTEND SERVICE LIFE Monthly Technical Progress Narrative, Sep. 1984
J. Matejczyk 8 Oct. 1984 7 p
(Contract NAS8-35507)
(NASA-CR-171177; NAS 1.26:171177) Avail: NTIS HC A02/MF A01 CSCL 20K

A fatigue crack growth model that incorporates crack growth retardation effects and is applicable to the materials characteristics and service environments of high performance LH2/LO2 engine systems is discussed. Future Research plans are outlined. R.S.F.

N85-10377*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
RESEARCH IN STRUCTURES AND DYNAMICS, 1984
Robert J. Hayduk, comp. and Ahmed K. Noor, comp. (George Washington Univ.) Washington Oct. 1984 416 p refs Conf. held in Washington, D.C., 22-25 Oct. 1984 Sponsored in cooperation with NSF, AFOSR, AIAA, the American Society of Mechanical Engineers, and the American Society of Civil Engineers
(NASA-CP-2335; L-15866; NAS 1.55:2335) Avail: NTIS HC A18/MF A01 CSCL 20K

A symposium on advanced and trends in structures and dynamics was held to communicate new insights into physical behavior and to identify trends in the solution procedures for structures and dynamics problems. Pertinent areas of concern were (1) multiprocessors, parallel computation, and database management systems, (2) advances in finite element technology, (3) interactive computing and optimization, (4) mechanics of materials, (5) structural stability, (6) dynamic response of structures, and (7) advanced computer applications. For individual titles, see N85-10378 through N85-10404.

N85-10378*# Flexible Computer Corp., Dallas, Tex.
THE FLEX/32 MULTICOMPUTING ENVIRONMENT
Nicholas Matelan *In* NASA. Langley Research Center Res. in Struct. and Dyn., 1984 Oct. 1984 p 1-14 ref (For primary document see N85-10377 01-39)
Avail: NTIS HC A18/MF A01 CSCL 20K

The FLEX/32 Multicomputer is a generic environment for cooperating multiple processors. The FLEX/32 supports a number of different processors, making it heterogeneous in terms of the instruction sets it supports, and homogeneous in its ability to provide consistent storage and input/output facilities to its differing processors. These facilities are accessed through standard 32-bit VMEbus connections. The FLEX/32 supports the full UNIX System V Operating System and languages associated with it, plus the extended ConCurrent C and Concurrent FORTRAN 77 languages that allow programming of concurrent software at a high level. Direct programming support at all levels is provided by the environment hardware for concurrent software execution and optimization, including hardware support for shared resource access arbitration, conditional critical region arbitration, and interprocessor messages. Author

N85-10379*# Texas Instruments, Inc., Dallas. Central Research Labs.
FINITE ELEMENT COMPUTATION ON NEAREST NEIGHBOR CONNECTED MACHINES
Alastair D. McAulay *In* NASA. Langley Research Center Res. in Struct. and Dyn., 1984 Oct. 1984 p 15-29 refs (For primary document see N85-10377 01-39)
Avail: NTIS HC A18/MF A01 CSCL 20K

Research aimed at faster, more cost effective parallel machines and algorithms for improving designer productivity with finite element computations is discussed. A set of 8 boards, containing 4 nearest neighbor connected arrays of commercially available floating point chips and substantial memory, are inserted into a commercially available machine. One-tenth Mflop (64 bit operation) processors provide an 89% efficiency when solving the equations arising in a finite element problem for a single variable regular grid of size 40 by 40 by 40. This is approximately 15 to 20 times faster than a much more expensive machine such as a VAX 11/780 used in double precision. The efficiency falls off as faster or more processors are envisaged because communication times become dominant. A novel successive overrelaxation algorithm which uses cyclic reduction in order to permit data transfer and computation to overlap in time is proposed. Author

N85-10380*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
APPLICATION OF CONCURRENT PROCESSING TO

STRUCTURAL DYNAMIC RESPONSE COMPUTATIONS
Jonathan Ransom, Olaf Sotrasali, and Robert Fulton *In its* Res. in Struct. and Dyn., 1984 Oct. 1984 p 31-44 refs (For primary document see N85-10377 01-39)
Avail: NTIS HC A18/MF A01 CSCL 20K

Described are the experiences gained from solving for the dynamic response of two simple structures on an experimental Multiple Instruction Multiple Data (MIMD) computer called the finite element machine. Introduced are MIMD computing concepts, describing how the concurrent algorithmic techniques implemented and giving results for the two example problems. The results show computational speedups of up to 7.83 using eight of the finite element machine processors and indicate that significant computational speedups are possible for large order structural computations. Author

N85-10381*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
INITIAL EXPERIENCE WITH DISTRIBUTING STRUCTURAL CALCULATIONS AMONG COMPUTERS OPERATING IN PARALLEL
James L. Rogers, Jr. and Jaroslaw Sobieszczanski-Sobieski *In its* Res. in Struct. and Dyn., 1984 Oct. 1984 p 45-54 refs (For primary document see N85-10377 01-39)
Avail: NTIS HC A18/MF A01 CSCL 20K

An existing program is currently being adapted to perform finite element analysis by distributing substructures over a network of four Apple IIe microcomputers connected to a shared disk. In this network, one microcomputer controls the entire process while the others perform the analysis on each substructure in parallel. This substructure analysis is used in an iterative, fully stressed, structural resizing procedure. This procedure allows experimentation with resizing in which all analyses are not completed during a single iteration. This research gives some insight on how to configure multidisciplinary analysis and optimization procedures for decomposeable engineering systems using either high performance engineering workstations or a parallel processor supercomputer. In addition, the operational experience gained facilitates the implementation of analysis programs on these new computers when they become available in an engineering environment. Author

N85-10382*# Arizona State Univ., Tempe. Dept. of Civil Engineering.
TEQUEL: THE QUERY LANGUAGE OF SADDLE c82
S. D. Rajan *In* NASA. Langley Research Center Res. in Struct. and Dyn., 1984 Oct. 1984 p 55-71 refs (For primary document see N85-10377 01-39)
Avail: NTIS HC A18/MF A01 CSCL 05B

A relational database management system is presented that is tailored for engineering applications. A wide variety of engineering data types are supported and the data definition language (DDL) and data manipulation language (DML) are extended to handle matrices. The system can be used either in the standalone mode or through a FORTRAN or PASCAL application program. The query language is of the relational calculus type and allows the user to store, retrieve, update and delete tuples from relations. The relational operations including union, intersect and differ facilitate creation of temporary relations that can be used for manipulating information in a powerful manner. Sample applications are shown to illustrate the creation of data through a FORTRAN program and data manipulation using the TEQUEL DML. M.A.C.

N85-10383*# Maryland Univ., College Park. Inst. for Physical Science and Technology.
PERFORMANCE OF THE h, p AND h-p VERSIONS c61
I. Babuska, W. Gui, and B. Szabo (Washington Univ., St. Louis) *In* NASA. Langley Research Center Res. in Struct. and Dyn., 1984 Oct. 1984 p 73-93 refs (For primary document see N85-10377 01-39)
(Contracts N00014-77-C-9623; N00014-81-K-0625; Grant NSF DMS-83-15216)
Avail: NTIS HC A18/MF A01 CSCL 09B

There are three basic versions of the finite element method, called the h, p and h-p versions. They are characterized by the way in which the finite element meshes and polynomial degree of elements are chosen. They differ in computer implementation (program architecture) and mathematical analysis. The manner in which the meshes and polynomial degree of the elements affect the accuracy of finite element solutions is examined. The approach is to fix certain parameters and increase the number of degrees of freedom so that the finie element solutions converge to the exact solution. Such a systematic increase of the number of degrees of freedom is called extension because it can be interpreted as a systematic extension of finite element spaces. M.A.C.

N85-10384*# Stanford Univ., Calif.
AUGMENTED WEAK FORMS AND ELEMENT-BY-ELEMENT PRECONDITIONERS: EFFICIENT ITERATIVE STRATEGIES FOR STRUCTURAL FINITE ELEMENTS. A PRELIMINARY STUDY
Arthur Muller and Thomas J. R. Hughes *In* NASA. Langley Research Center Res. in Struct. and Dyn., 1984 Oct. 1984 p 95-109 refs (For primary document see N85-10377 01-39)
(Grant NAG3-319)
Avail: NTIS HC A18/MF A01 CSCL 20K

A weak formulation in structural analysis that provides well conditioned matrices suitable for iterative solutions is presented. A mixed formulation ensures the proper representation of the problem and the constitutive relations are added in a penalized form. The problem is solved by a double conjugate gradient algorithm combined with an element by element approximate factorization procedure. The double conjugate gradient strategy resembles Uzawa's variable-length type algorithms the main difference is the presence of quadratic terms in the mixed variables. In the case of shear deformable beams these terms ensure that the proper finite thickness solution is obtained. E.A.K.

N85-10385*# Naval Weapons Center, China Lake, Calif.
STRESS-DERIVATIVE CONTROL OF KEYSTONING DEFORMATION IN FINITE ELEMENT CODES
J. C. Schulz and O. E. R. Heimdahl *In* NASA. Langley Research Center Res. in Struct. and Dyn., 1984 Oct. 1984 p 111-122 refs (For primary document see N85-10377 01-39)
Avail: NTIS HC A18/MF A01 CSCL 20K

The stress derivative technique for control of keystoning deformation in under-integrated finte elements is based on expansion of the stress in a Taylor series about the element center and retention of additional terms beyond the constant stress term. It has the advantage over other control techniques that keystoning resistance is provided by actual rather than artificial material properties. Application of this technique to the quadrilateral ring elements used for modelling solids of revolution subjected to axisymmetric loads is described. In a cylindrical coordinate system additional terms appear in the formulation which must be dealt with in arriving at a workable keystoning control scheme. E.A.K.

N85-10386*# Maryland Univ., College Park. Dept. of Aerospace Engineering.
A TRIANGULAR FINITE ELEMENT FOR THIN PLATES AND SHELLS
S. W. Lee and C. C. Dai *In* NASA. Langley Research Center Res. in Struct. and Dyn., 1984 Oct. 1984 p 123-142 refs (For primary document see N85-10377 01-39)
Avail: NTIS HC A18/MF A01 CSCL 20K

A finite element modeling technique which utilizes a triangular element called TSHEL with 45 degrees of freedom and seven point integration was tested for analysis of thin plate and shell structures. The element formulation is based on the degenerate solid shell concept and the mixed formulation with assumed independent inplane and transverse shear strains. The effectiveness of the present modeling technique which features combined use of elements with kinematic modes and those without kinematic modes to eliminate both locking and spurious kinematic modes at the global structural levels are shown. E.A.K.

N85-10387*# Colorado Univ., Boulder. Dept. of Civil Engineering.
INTERACTIVE GRAPHICS NONLINEAR CONSTRAINED OPTIMIZATION c61
Victor E. Saouma and Efthimios S. Sikiotis *In* NASA. Langley Research Center Res. in Struct. and Dyn., 1984 Oct. 1984 p 143-157 refs (For primary document see N85-10377 01-39)
(Grant NSF CEE-84-05621)
Avail: NTIS HC A18/MF A01 CSCL 09B

An interactive computer graphics environment was used for nonlinear constrained optimization analysis. It is found that by combining the power of a digital computer with the subtlety of engineering judgment during program execution, final results can be substantially better than the ones achieved by the numerical algorithm by itself. E.A.K.

N85-10388*# Colorado Univ., Boulder. Dept. of Civil Engineering.
SENSITIVITY ANALYSIS OF LIMIT STATE FUNCTIONS FOR PROBABILITY-BASED PLASTIC DESIGN
Dan M. Frangopol *In* NASA. Langley Research Center Res. in Struct. and Dyn., 1984 Oct. 1984 p 159-179 refs (For primary document see N85-10377 01-39)
Avail: NTIS HC A18/MF A01 CSCL 20K

The evaluation of the total probability of a plastic collapse failure P sub f for a highly redundant structure of random interdependent plastic moments acted on by random interdepedent loads is a difficult and computationally very costly process. The evaluation of reasonable bounds to this probability requires the use of second moment algebra which involves man statistical parameters. A computer program which selects the best strategy for minimizing the interval between upper and lower bounds of P sub f is now in its final stage of development. The relative importance of various uncertainties involved in the computational process on the resulting bounds of P sub f, sensitivity is analyzed. Response sensitivities for both mode and system reliability of an ideal plastic portal frame are shown. E.A.K.

N85-10389*# Grumman Aerospace Corp., Bethpage, N.Y.
COMPOSITE LAMINATE OPTIMIZATION PROGRAM SUITABLE FOR MICROCOMPUTERS
Gerald V. Flanagan and Anthony N. Palazotto (Air Force Inst. of Tech.) *In* NASA. Langley Research Center Res. in Struct. and Dyn., 1984 Oct. 1984 p 181-183 refs (For primary document see N85-10377 01-39)
Avail: NTIS HC A18/MF A01 CSCL 20K

The design of a composite panel requires some way of finding the minimum thickness laminate which will withstand the load requirements without failure. The mathematical complexity of this problem dictates the use of nonlinear optimization techniques. Specialized laminate optimization programs were developed which are compact and efficient enough to run on microcomputers. Only stresses at a point and inplane loads and deflections are considered. The programs are simple to use and require no knowledge of optimization. Techniques are developed which find minimum thickness laminates with either ply ratios or ply angles as design variables. A method is presented for finding the optimum orientation for the axis of symmetry of an orthotropic laminate. The orthotropic laminate program uses an approximate failure theory, which speed up computations dramatically. E.A.K.

N85-10390*# Los Alamos Scientific Lab., N. Mex. Theoretical Div.
FRACTURE, FAILURE, AND FRAGMENTATION
John K. Dienes *In* NASA. Langley Research Center Res. in Struct. and Dyn., 1984 Oct. 1984 p 185-195 refs (For primary document see N85-10377 01-39)
Avail: NTIS HC A18/MF A01 CSCL 20K

A general approach is required for describing matter of behavior when the failure is likely to involve growth and coalescence of a large number of fractures. Failures of this kind appear frequently in rapid dynamic processes, particularly in the formation of spall fragments. An approach to formulating constitutive relations that accounts for the opening, shear and growth of an ensemble of cracks is discussed. The approach accounts for plastic flow accompanying fragmentation. The resulting constitutive relations were incorporated into a Lagrangian computer program. A theoretical approach to coalescence is described. The simplest formulation uses a linear Liouville equation, with crack growth limited by the mean free path of cracks, assumed constant. This approach allows for an anisotropic distribution of cracks. An alternative approach in which the decrease of the mean free path with increasing crack size is accounted for, but the crack distribution is assumed isotropic is described. A reduction of the governing Liouville equation to an ordinary differential equation of third order is possible, and the result can be used to determine how mean free path decreases with increasing crack size. E.A.K.

N85-10391*# Grand Valley State Coll., Allendale, Mich.
SHEAR DEFORMATION PLATE CONTINUA OF LARGE DOUBLE-LAYERED SPACE STRUCTURES
Mohamed Samir Hefzy and Adnan H. Nayfeh (Cincinnati Univ.) *In* NASA. Langley Research Center Res. in Struct. and Dyn., 1984 Oct. 1984 p 197-217 refs (For primary document see N85-10377 01-39)
(Grant NsG-1185)
Avail: NTIS HC A18/MF A01 CSCL 20K

The energy equivalence to construct equivalent continua for the actual lattice structure is described. An energy equivalent continuum is defined as that which has the same amount of strain and kinetic energies stored in it as the original lattice structure when both are subjected to the same loading conditions. The equivalent continuum is characterized by its strain and kinetic energies from which the constitutive relations and the equations of motion can be derived. A simple method to model large rigid jointed lattices as continuous media with couple stresses is presented. The transition from the discrete system to the continuous medium is achieved by expanding the displacements and the rotations of the nodal points in a Taylor series about a suitable chosen origin. Basic kinematic assumptions are introduced to insure that the assumptions used in deriving the governing equations of the modeled continuum are satisfied. The number of terms retained in the Taylor series expansion will depend upon the properties to be evaluated. This implies that the kind of continuum needed to model from the discrete lattice, before the actual properties are derived was to predetermined. E.A.K.

N85-10392*# Washington Univ., St. Louis, Mo.
INTERACTIVE BUCKLING OF THIN-WALLED STRUCTURAL COMPONENTS UNDER STATIC AND DYNAMIC LOADS
Srinivasan Sridharan and Rafael Benito (Nutech International, Madrid) *In* NASA. Langley Research Center Res. in Struct. and Dyn., 1984 Oct. 1984 p 219-236 refs (For primary document see N85-10377 01-39)
(Grant NSF CEE-82-04673)
Avail: NTIS HC A18/MF A01 CSCL 20K

Recent advances in the study of interactive buckling of thin walled structural components achieved with the aid of finite strip technique used in conjunction with the theory of mode interaction are summarized. The interaction of the primary local mode with Euler buckling (in columns) and flexural torsional buckling (in columns and beams) is of primary interest. The interaction of two companion local modes with the overall mode is also considered briefly for the columns with doubly symmetric cross sections. The effect of dynamic loads in the form of suddenly applied and compression is also investigated. R.J.F.

N85-10393*# Novatome, Le Pessis-Robinson (France).
INITIAL POSTBUCKLING ANALYSIS OF ELASTOPLASTIC THIN-SHEAR STRUCTURES
E. G. Carnoy and G. Pancsyan *In* NASA. Langley Research Center Res. in Struct. and Dyn., 1984 Oct. 1984 p 237-250 refs (For primary document see N85-10377 01-39)
Avail: NTIS HC A18/MF A01 CSCL 20K

The design of thin shell structures with respect to elastoplastic buckling requires an extended analysis of the influence of initial

imperfections. For conservative design, the most critical defect should be assumed with the maximum allowable magnitude. This defect is closely related to the initial postbuckling behavior. An algorithm is given for the quasi-static analysis of the postbuckling behavior of structures that exhibit multiple buckling points. the algorithm based upon an energy criterion allows the computation of the critical perturbation which will be employed for the definition of the critical defect. For computational efficiency, the algorithm uses the reduced basis technique with automatic update of the modal basis. The method is applied to the axisymmetric buckling of cylindrical shells under axial compression, and conclusions are given for future research. R.J.F.

N85-10394*# Kaman Avidyne, Burlington, Mass.
NONLINEAR DYNAMIC ANALYSIS OF SANDWICH PANELS
Allen M. Lush *In* NASA. Langley Research Center Res. in Struct. and Dyn., 1984 Oct. 1984 p 251-268 refs (For primary document see N85-10377 01-39)
Avail: NTIS HC A18/MF A01 CSCL 20K

Two analytical techniques applicable to large deflection dynamic response calculations for pressure loaded composite sandwich panels are demonstrated. One technique utilizes finite element modeling with a single equivalent layer representing the face sheets and core. The other technique utilizes the modal analysis computer code DEPROP which was recently modified to include transverse shear deformation in a core layer. The example problem consists of a simply supported rectangular sandwich panel. Included are comparisons of linear and nonlinear static response calculations, in addition to dynamic response calculations. R.J.F.

N85-10395*# Texas Technological Univ., Lubbock. Dept. of Mechanical Engineering.
NON-GAUSSIAN APPROACH FOR PARAMETRIC RANDOM VIBRATION OF NON-LINEAR STRUCTURES
R. A. Ibrahim and A. Soundararajan *In* NASA. Langley Research Center Res. in Struct. and Dyn., 1984 Oct. 1984 p 269-287 refs (For primary document see N85-10377 01-39)
(Grant NSF MEA-83-13572)
Avail: NTIS HC A18/MF A01 CSCL 20K

The dynamic response of a nonlinear, single degree of freedom structural system subjected to a physically white noise parametric excitation is investigated. The Ito stochastic calculus is employed to derive a general differential equation for the moments of the response coordinates. The differential equations of moments of any order are found to be coupled with higher order moments. A non-Gaussian closure scheme is developed to truncate the moment equations up to fourth order. The statistical of the stationary response are computed numerically and compared with analytical solutions predicted by a Gaussian closure scheme and the stochastic averaging method. It is found that the computed results exhibit the jump phenomenon which is typical of the characteristics of deterministic nonlinear systems. In addition, the numerical algorithm leads to multiple solutions all of which give positive mean squares. However, two of these solutions are found to violate the properties of high order moments. One solution preserves the moments properties and demonstrates that the system achieves a stationary response. R.J.F.

N85-10396*# National Bureau of Standards, Washington, D.C.
RESPONSE AND CHARACTERISTICS OF STRUCTURES SUBJECTED TO S-H WAVES
Spencer T. Wu *In* NASA. Langley Research Center Res. in Struct. and Dyn., 1984 Oct. 1984 p 289-296 refs (For primary document see N85-10377 01-39)
Avail: NTIS HC A18/MF A01 CSCL 20K

A study of the dynamic characteristics of a coupled translational-rotational system is given. The formulation of the problem considers the soil-structure interaction effects by utilizing the impedance functions at the foundation of a structure. Due to the fact that the coefficient matrix in the characteristic equation is frequency dependent in nature, iterations have to be performed to find the nature frequencies of the system. Examples and discussions are presented. Comparisons of the analytical results from various approaches are also given. R.J.F.

N85-10397*# Texas Univ., Austin.
NUMERICAL ANALYSIS OF SOME PROBLEMS RELATED TO THE MECHANICS OF PNEUMATIC TIRES: FINITE DEFORMATION/ROLLING CONTACT OF A VISCOELASTIC CYLINDER AND FINITE DEFORMATION OF CORD-REINFORCED RUBBER COMPOSITES c37
J. Tinsley Oden, Eric B. Becker, T. L. Lin, and K. T. Hsieh *In* NASA. Langley Research Center Res. in Struct. and Dyn., 1984 Oct. 1984 p 297-314 refs (For primary document see N85-10377 01-39)
(Contract NAS1-17359)
Avail: NTIS HC A18/MF A01 CSCL 20K

The formulation and numerical analysis of several problems related to the behavior of pneumatic tires are considered. These problems include the general rolling contact problem of a rubber-like viscoelastic cylinder undergoing finite deformations and the finite deformation of cord-reinforced rubber composites. New finite element models are developed for these problems. Numerical results obtained for several representative cases are presented. Author

N85-10398*# Ballistic Research Labs., Aberdeen Proving Ground, Md.
SIMULATION OF CONTACT SURFACE EROSION FOR IMPACT PROBLEMS
K. D. Kimsey and J. A. Zukas *In* NASA. Langley Research Center Res. in Struct. and Dyn., 1984 Oct. 1984 p 315-324 refs (For primary document see N85-10377 01-39)
Avail: NTIS HC A18/MF A01 CSCL 20K

An algorithm is outlined for simulating the contact surface erosion for impact problems. The algorithm dynamically relocates the contact surface as projectile and target materials exceed their failure criterion. Example computations of axisymmetric and oblique impacts are compared with experimental data. A.R.H.

N85-10399*# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
CRASHWORTHINESS OF LIGHT AIRCRAFT FUSELAGE STRUCTURES: A NUMERICAL AND EXPERIMENTAL INVESTIGATION c05
A. P. Nanyaro, R. C. Tennyson, and J. S. Hansen *In* NASA. Langley Research Center Res. in Struct. and Dyn., 1984 Oct. 1984 p 325-346 refs (For primary document see N85-10377 01-39)
Avail: NTIS HC A18/MF A01 CSCL 01C

The dynamic behavior of aircraft fuselage structures subject to various impact conditions was investigated. An analytical model was developed based on a self-consistent finite element (CFE) formulation utilizing shell, curved beam, and stringer type elements. Equations of motion were formulated and linearized (i.e., for small displacements), although material nonlinearity was retained to treat local plastic deformation. The equations were solved using the implicit Newmark-Beta method with a frontal solver routine. Stiffened aluminum fuselage models were also tested in free flight using the UTIAS pendulum crash test facility. Data were obtained on dynamic strains, g-loads, and transient deformations (using high speed photography in the latter case) during the impact process. Correlations between tests and predicted results are presented, together with computer graphics, based on the CFE model. These results include level and oblique angle impacts as well as the free-flight crash test. Comparisons with a hybrid, lumped mass finite element computer model demonstrate that the CFE formulation provides the test overall agreement with impact test data for comparable computing costs. A.R.H.

N85-10400*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ANALYSIS OF A TRANSPORT FUSELAGE SECTION DROP TEST c05
E. L. Fasanella (Kentron International, Inc., Hampton, Va.), R. J.

Hayduk, M. P. Robinson, and E. Widmayer (Boeing Commercial Airplane Co., Seattle) *In its* Res. in Struct. and Dyn., 1984 Oct. 1984 p 347-368 refs (For primary document see N85-10377 01-39)
Avail: NTIS HC A18/MF A01 CSCL 01C

Transport fuselage section drop tests provided useful information about the crash behavior of metal aircraft in preparation for a full-scale Boeing 720 controlled impact demonstration (CID). The fuselage sections have also provided an operational test environment for the data acquisition system designed for the CID test, and data for analysis and correlation with the DYCAST nonlinear finite-element program. The correlation of the DYCAST section model predictions was quite good for the total fuselage crushing deflection (22 to 24 inches predicted versus 24 to 26 inches measured), floor deformation, and accelerations for the floor and fuselage. The DYCAST seat and occupant model was adequate to approximate dynamic loading to the floor, but a more sophisticated model would be required for good correlation with dummy accelerations. Although a full-section model using only finite elements for the subfloor was desirable, constraints of time and computer resources limited the finite-element subfloor model to a two-frame model. Results from the two-frame model indicate that DYCAST can provide excellent correlation with experimental crash behavior of fuselage structure with a minimum of empirical force-deflection data representing structure in the analytical model. A.R.H.

N85-10401*# Rockwell International Corp., Downey, Calif.
STRUCTURAL ANALYSIS OF THE SPACE SHUTTLE ORBITER c16
Henry R. Grooms and James H. Johnson, Jr. *In* NASA. Langley Research Center Res. in Struct. and Dyn., 1984 Oct. 1984 p 369-383 refs (For primary document see N85-10377 01-39)
Avail: NTIS HC A18/MF A01 CSCL 22B

The structural analysis of the Space Shuttle orbiter was planned with two concepts in mind: use derivatives or subsets of the same basic finite element model whenever feasible, and substantiate the model's predictive capability by performing ground tests. The analysis cycle (model modal loads stress (MMLS)) starts with the finite element model conception and ends with the detailed stress analysis and margins of safety. The structural analysis of the orbiter encompasses a variety of static and dynamic problems. The salient features of these problems and their solutions are examined. A.R.H.

N85-10402*# Rockwell International Corp., Downey, Calif.
SINGLE-DROP IMPACT DAMAGE PREDICTION FOR LOW DENSITY, COATED CERAMIC MATERIALS
David Mustelier *In* NASA. Langley Research Center Res. in Struct. and Dyn., 1984 Oct. 1984 p 385-393 refs (For primary document see N85-10377 01-39)
Avail: NTIS HC A18/MF A01 CSCL 20K

A technique utilizing finite element analysis, liquid impact kinematics, and momentum theory is described and compared to single-drop impact test data performed on various configurations of coated ceramic material. The method correlates well with test data and is useful in predicting the single-drop impact damage velocity threshold for low-density, coated ceramic materials. Author

N85-10403*# Alberta Univ., Edmonton. Dept. of Civil Engineering.
FINITE ELEMENT MODELLING OF BURIED STRUCTURES
David K. Playdon and Sidney H. Simmonds *In* NASA. Langley Research Center Res. in Struct. and Dyn., 1984 Oct. 1984 p 395-404 ref (For primary document see N85-10377 01-39)
Avail: NTIS HC A18/MF A01 CSCL 20K

In many structures the final stress states are dependent on the sequence of construction or the stress states at various stages of construction are of interest. Such problems can be analyzed using finite element programs that have the capability of adding (birthing) elements to simulate the progress of construction. However, the usual procedure of assembling elements may lead to numerical instabilities or stress states that are unrealistic. Both problems are demonstrated in the analysis of a structure using the program ADINA. A technique which combines application of a preload with element birthing to overcome these problems is described and illustrated. Author

N85-10404*# Bennett Computational Mechanics, Pleasant Hill, Calif.
ON THE COMPUTER ANALYSIS OF STRUCTURES AND MECHANICAL SYSTEMS c61
Bruce E. Bennett *In* NASA. Langley Research Center Res. in Struct. and Dyn., 1984 Oct. 1984 p 405-422 refs (For primary document see N85-10377 01-39)
Avail: NTIS HC A18/MF A01 CSCL 09B

The governing equations for the analysis of open branch-chain mechanical systems are developed in a form suitable for implementation in a general purpose finite element computer program. Lagrange's form of d'Alembert's principle is used to derive the system mass matrix and force vector. The generalized coordinates are selected as the unconstrained relative degrees of freedom giving the position and orientation of each slave link with respect to their master link. Each slave link may have from zero to six degrees of freedom relative to the reference frames of its master link. A strategy for automatic generation of the system mass matrix and force vector is described. Author

N85-10405*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
VIBRATION, ACOUSTIC, AND SHOCK DESIGN AND TEST CRITERIA FOR COMPONENTS ON THE SOLID ROCKET BOOSTERS (SRB), LIGHTWEIGHT EXTERNAL TANK (LWT), AND SPACE SHUTTLE MAIN ENGINES (SSME)
Sep. 1984 812 p
(NASA-RP-1127; NAS 1.61:1127) Avail: NTIS HC A99/MF A01 CSCL 20K

The vibration, acoustics, and shock design and test criteria for components and subassemblies on the space shuttle solid rocket booster (SRB), lightweight tank (LWT), and main engines (SSME) are presented. Specifications for transportation, handling, and acceptance testing are also provided. R.S.F.

N85-10406# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
CONTROL OF THE DYNAMIC RESPONSE OF A DAMPED MEMBRANE BY DISTRIBUTED FORCES
I. Sadek (California Univ., Santa Barbara) and S. Adali Jun. 1983 40 p refs
(CSIR-TWISK-312) Avail: NTIS HC A03/MF A01

The problem of damping out the oscillations of a rectangular membrane by means of distributed forces is solved analytically. The membrane is initiated by given initial displacement and velocity conditions. The basic control problem is to minimize the deflection and the velocity of displacements in a given period of time with the minimum possible expenditure of force. A quadratic vector performance index is chosen as the cost functional which comprises the functionals of the deflection, velocity and the distributed force. The necessary conditions of optimality are obtained from a control theory approach and formulated in the form of a maximum principle in terms of an adjoint variable. Numerical results are given for various problem parameters and the efficiency of the control mechanism is investigated. The optimal tradeoff curves, which represent the points of optimum performance, are given for a couple of example problems with multiple objectives. Author

N85-10407# National Aerospace Lab., Tokyo (Japan). Second Airframe Div.
DISTRIBUTIONS OF FATIGUE LIFE AND FATIGUE STRENGTH IN NOTCHED SPECIMENS OF A CARBON 8-HARNESS-SATIN LAMINATE
Toshiyuki Shimokawa and Yasumasa Hamaguchi May 1984 13 p refs Presented at the 4th Intern. Conf. on Composite Mater., ICCM-4, Tokyo, 25-27 Oct. 1982

(NAL-TR-809T; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

The distribution properties of fatigue life and fatigue strength in sharply notched specimens of a carbon fabric laminate made up of three layers of eight harness satin/epoxy prepreg sheets were investigated. Fatigue life distributions were obtained at six stress levels by fatigue tests of four point plane bending under a constant temperature and humidity condition. Sample sizes were 30 for each of the three high stress levels and 12 for the three low stress levels. The amount of scatter and distributional form of fatigue life and fatigue strength are discussed. It is concluded that fatigue strength distribution is normal and its standard deviation is constant regardless of fatigue life. E.A.K.

N85-10408# Pennsylvania State Univ., University Park. Applied Research Lab.

RESONANT FREQUENCIES AND MODE SHAPES FOR SINGLE AND DOUBLE CYLINDRICAL SHELLS

C. B. Burroughs, S. I. Hayek, D. A. Bostian, and J. E. Hallander 23 Sep. 1983 102 p

(Contract N00024-79-C-6043)

(AD-A144778; TM-83-169) Avail: NTIS HC A06/MF A01 CSCL 20/11

Resonant frequencies and mode shapes for single and double cylindrical shells are identified from measurements made with the shells in air and in water. The single shell assembly consists of five ribbed sections bolted together and closed at each end with watertight endcaps. Outer shells are wrapped around the inner shell assembly to produce the double shell assembly. The space between the inner and outer shells is free flooded. Resonant frequencies are reported for frequencies up to 1000 Hz. For frequencies above 1000 Hz the resonant modal density is too high to allow separation of all of the resonant frequencies. Because of the limited number of accelerators inside the shell assembly, only the first eight resonant bending modes are identified. It is shown that submerging the shell assembly in water reduces the resonant frequencies of the lowest bending modes to nearly one half of the frequencies for the shell assembly in air. Author (GRA)

N85-10409# Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.

DESIGN PROPOSALS FOR TORSIONAL BUCKLING OF STIFFENERS M.S. Thesis

S. L. Coulter May 1984 82 p

(Contract N66314-70-A-0073)

(AD-A144783) Avail: NTIS HC A05/MF A01 CSCL 20/11

The ability to predict torsional instability in the early stages of design can have important consequences on the design of both conventional and high performance ships. This thesis develops fast approximate methods of torsional buckling analysis for particular application in the concept, feasibility, and preliminary stages of ship design. Two simplified models of stiffeners commonly used in ship construction were presented. The first was an ideal I section stiffener. The second, a flat bar stiffener, which was included in this analysis because of its favorable productional properties and wide usage. These models, with initial imperfections, were subjected to axial compressive end loading and the resultant behavior analyzed. The approach of the analysis of this thesis was an application of the energy method to determine the critical buckling stress instead of the more commonly used equilibrium approach. Both beam theory and thin plate theory were used in energy-work relationships in these derivations. Then the first yield load was determined utilizing the Perry-Robertson approach. Integrated into all phases of this exploration was the concept of the geometric imperfections of the stiffeners. Author (GRA)

N85-10410# George Washington Univ., Washington, D.C. Inst. for Reliability and Risk Analysis.

ESTIMATION OF THE THRESHOLD IN FATIGUE CRACK INITIATION MODELS: A BAYESIAN APPROACH

N. D. Singpurwalla and R. Soyer 25 Oct. 1983 31 p

(Contract N00019-82-C-0458)

(AD-A144847; AD-E751084; GWU/IRRA/TR-83/4) Avail: NTIS HC A03/MF A01 CSCL 20/11

A Bayesian approach for the estimation of the threshold parameter in a probability model for fatigue crack failures is presented. The Weibull and the lognormal distributions are considered as suitable models for the number of cycles to crack initiation. The approach is discussed for the two models, and real life data from aircraft engine disks is analyzed. Author (GRA)

N85-10411# Systems Science and Software, La Jolla, Calif.

DEVELOPMENT OF ADVANCED CONSTITUTIVE MODEL FOR REINFORCED CONCRETE Final Report, 1 Mar. 1981 - 29 Feb. 1984

G. A. Hegemier, H. E. Read, and H. Murakami 30 Apr. 1984 177 p

(Contracts F49620-81-C-0033; DNA001-84-C-0127)

(AD-A145050; SSS-R-84-6684; AFOSR-84-0750TR) Avail: NTIS HC A09/MF A01 CSCL 13/13

The objective of this research was to develop an advanced, nonlinear, multiaxial constitutive theory for reinforced concrete which provides a modeling capability that is superior to existing models, especially in the nonlinear response regime. The problem of constructing such a theory is partitioned into two major tasks, which have been pursued concurrently. One task consists of formulating a procedure (mixture theory) for analytically mixing reinforcing steel and plain concrete, so that the interaction between the two, which plays a key role in the overall behavior of reinforced concrete, is properly modeled. The other task consists of developing a model of plain concrete, which accurately portrays its nonlinear, multiaxial behavior and which is computationally feasible for use in conjunction with the mixture theory. The mixture theory is designed to synthesize the global constitutive properties of reinforced concrete from the properties of plain concrete, steel, interfaces and reinforcing geometry. The progress made during the course of the program toward achieving the above research objectives is summarized. A detailed account of the accomplishments made during the third year of the program are given, since these are not available elsewhere. Finally, a list of the publications and technical interactions which resulted from this research is given. GRA

N85-10412# Princeton Univ., N. J. Dept. of Civil Engineering.

THEORY OF NONLOCAL ELASTICITY AND SOME APPLICATIONS

A. C. Eringen Apr. 1984 65 p

(Contract N00014-83-K-0126)

(AD-A145201; Rept-84-SM-9; TR-62) Avail: NTIS HC A04/MF A01 CSCL 20/11

Constitutive equations of finite nonlocal elasticity are obtained. Thermodynamic restriction are studied. The linear theory is given for anisotropic and isotropic solids. The physical and mathematical properties of the nonlocal elastic moduli are explored through lattice dynamics and dispersive wave propagations. The theory is applied to the problems of surface waves, screw dislocation and a crack. Excellent agreements with the results known in atomic lattice dynamics and experiments display the power and potential of the theory. Author (GRA)

N85-10413# Oak Ridge National Lab., Tenn.

IMPROVED MULTIAXIAL CREEP-RUPTURE STRENGTH CRITERION

R. L. Huddleston 17 Jun. 1984 9 p refs Presented at ASME Pressure Vessel and Piping Conf., San Antonio, 17 Jun. 1984

(Contract DE-AC05-84OR-21400)

(DE84-014273; CONF-840647-24) Avail: NTIS HC A02/MF A01

A strength model developed for predicting creep rupture under multiaxial stress states incorporates four stress parameters and distinguishes between life under tensile versus compressive stress states. Assessments of the model based on experimental biaxial creep rupture data for type 304 stainless steel tested at 593 C show the model to be significantly more accurate than the classical criteria of Mises, Tresca, or Rankine. DOE

N85-10414# GKSS-Forschungszentrum Geesthacht (West Germany). Inst. fuer Werkstofftechnologie.

ON THE TREATMENT OF MATERIAL LAWS FOR APPROXIMATE J-ESTIMATION METHODS
A. Cornec and T. Seeger (Technischen Hochschule, Darmstadt, West Germany) 1984 27 p refs
(GKSS-84-E-15; ISSN-0344-9629) Avail: NTIS HC A03/MF A01

Methods which take into account the influence of arbitrarily shaped real material laws on the J-integral and displacement behavior are generated using standard formulas valid only for specific power laws. A study using idealized material laws with two distinct strain hardening regions was carried out. The influence on J was evaluated by a systematic variation of the parameters of these idealized material laws. The halving method is the most generally applicable, but the adjustment method is the most accurate. Author (ESA)

N85-10415# GKSS-Forschungszentrum Geesthacht (West Germany). Inst. fuer Werkstofftechnologie.
CRACK TIP OPENING DISPLACEMENT FOR WORK HARDENING MATERIALS
K.-H. Schwalbe 1984 10 p refs Presented at ASTM Comm. Week, Jacksonville, Fla., 8-13 Apr. 1984
(GKSS-84-E-26; ISSN-0344-9629) Avail: NTIS HC A02/MF A01

Starting with a Mode III-Mode I Analog, a closed form solution for the crack tip opening displacement for work hardening materials is derived for plane stress and plane strain. The results agree very well with finite element calculations, and with experimental data. Author (ESA)

N85-10416# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
FLIGHT SIMULATION FATIGUE CRACK PROPAGATION IN METAL/CARBON-EPOXY LAMINATES
R. J. H. Wanhill Dec. 1982 37 p refs
(Contract NIVR-1891)
(NLR-TR-83006-U) Avail: NTIS HC A03/MF A01

Flight simulation fatigue crack propagation tests with gust spectrum loading were carried out on laminates of aluminum alloy 2024-T3/carbon-epoxy, aluminum alloy 7475-T761/carbon-epoxy and titanium alloy Ti-6Al-4V/carbon-epoxy with nominal weight savings of 30% and 40% as compared to equivalent 2024-T3 Alclad and 7475-T761 panels. The performance of the 2024-T3/carbon-epoxy laminates is much superior to that of the other material combinations, and is very encouraging for the practical achievement of significant weight savings. Author (ESA)

N85-10121# Joint Publications Research Service, Arlington, Va.
FRACTURE TOUGHNESS CHARACTERISTICS OF WELDED JOINTS IN VT6S AND AT6 TITANIUM ALLOYS Abstract Only
S. I. Yesina, S. M. Kutepov, and V. N. Skorokhodov *In its* USSR Rept.: Mater. Sci. and Met., No. 93 (JPRS-84810) 25 Nov. 1983 p 34 Transl. into ENGLISH from Avtomat. Svarka (Kiev), no. 6, Jun. 1983 p 43-45 (For primary document see N85-10110 01-23)
Avail: NTIS HC A04

N85-10127# Joint Publications Research Service, Arlington, Va.
EVALUATION OF THE ROLE OF DIFFUSION CREEP IN SUPERPLASTIC DEFORMATION Abstract Only
R. Z. Valiyev and V. I. Sergeyev *In its* USSR Rept.: Mater. Sci. and Met., No. 93 (JPRS-84810) 25 Nov. 1983 p 55-56 Transl. into ENGLISH from Izv. Vyssh. Uchab. Zaved.: Tsvetnaya Met. (Ordzhonikidze, USSR), no. 3, May - Jun. 1983 p 81-84 (For primary document see N85-10110 01-23)
Avail: NTIS HC A04

42 GEOSCIENCES (GENERAL)

N85-10417# Council for Scientific and Industrial Research, Pretoria (South Africa). South African National Committee on Antarctic Research.
SOUTH AFRICAN ANTARCTIC RESEARCH REPORT TO SCAR, NO. 24, 1982. 1: RECORD OF ACTIVITIES: APRIL 1981 - SEPTEMBER 1982. 2: PLANNED ACTIVITIES: OCTOBER 1982 - SEPTEMBER 1983. 3: RECENT PUBLICATIONS: 1981/1982
Sep. 1982 36 p
(CSIR-SR-SCAR-24) Avail: NTIS HC A03/MF A01

Information is given on South African Antarctic research activities between April 1981 and September 1982. Activities of the atmospheric, biological, earth sciences and oceanographic programs are discussed. R.J.F.

N85-10418*# National Aeronautics and Space Administration, Washington, D. C.
NASA GEODYNAMICS PROGRAM Annual Report, May 1983 - May 1984
Oct. 1984 98 p refs
(NASA-TM-87359; NAS 1.15:87359; AR-5) Avail: NTIS HC A05/MF A01 CSCL 08G

Activities and achievements for the period of May 1983 to May 1984 for the NASA geodynamics program are summarized. Abstracts of papers presented at the Conference are inlcuded. Current publications associated with the NASA Geodynamics Program are listed. E.A.K.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N85-10419 Bayerische Akademie der Wissenschaften, Munich (West Germany). Geodaetische Kommission.
DIRECTION DEPENDENT RADIATION BEHAVIOR IN THE CLASSIFICATION OF MULTISPECTRAL AIRCRAFT REMOTE SENSING DATA Ph.D. Thesis - Karlsruhe Univ. [RICHTUNGSABHAENGIGES STRAHLUNGSVERHALTEN BEI DER KLASSIFIZIERUNG VON MULTISPEKTRALEN FLUGZEUGABTASTDATEN]
Berthold Pfeiffer 1983 103 p refs In GERMAN
(SER-C-290; ISBN-3-7696-9340-X; ISSN-0065-5325) Copyright. Avail: Issuing Activity

A method for direction-independent classification of multispectral aircraft remote sensing data is presented. The data analysis method to determine the direction dependence is based on the utilization of training regions whose average intensity value is subject to a trend analysis by regression polynomials. The direction dependence is mainly due to the non-Lambert reflection behavior of the object itself, with the atmosphere only having a modifying effect. The object has therefore to be known to correct for the direction dependence. It is proposed to take the direction dependence into account during the classification procedure. The method is based on the maximum likelihood method and the application of direction dependent statistics. Classification accuracies higher than 90% for correctly integrated points in test regions are obtained in contrast with the 60% in non-direction-dependent classification. Author (ESA)

N85-10420 Bayerische Akademie der Wissenschaften, Munich (West Germany). Geodaetische Kommission.
A STRATEGY FOR THE ADJUSTMENT AND ANALYSIS OF DENSIFICATION NETWORKS Ph.D. Thesis - Karlsruhe Univ. [EINE STRATEGIE ZUR AUSGLEICHUNG UND ANALYSE VON VERDICHTUNGSNETZEN]
Ralf Bill 1984 91 p refs In GERMAN
(Ser-C-295; ISBN-3-7696-9345-0; ISSN-0065-5325) Copyright. Avail: Issuing Activity

A multistage geodetic network adjustment concept is proposed. The mathematical modelling on which the single stages are based is compared with a simulated network example. Statistical tests to

check observations and gross errors make it possible to verify the accuracy of the adjustment results by qualitative statistical probability criteria, supporting or replacing measures mainly based on experience. The proposed strategy is successfully tested on real networks. Author (ESA)

N85-10421*# City Coll. of the City Univ. of New York. Inst. of Marine and Atmospheric Sciences.
A MONTE CARLO COMPARISON OF THE RECOVERY OF WINDS NEAR UPWIND AND DOWNWIND FROM THE SASS-1 MODEL FUNCTION BY MEANS OF THE SUM OF SQUARES ALGORITHM AND A MAXIMUM LIKELIHOOD ESTIMATOR
Willard J. Pierson, Jr. Washington NASA Oct. 1984 141 p refs
(Grant NAGw-266)
(NASA-CR-3839; NAS 1.26:3839) Avail: NTIS HC A07/MF A01 CSCL 04B

Backscatter measurements at upwind and crosswind are simulated for five incidence angles by means of the SASS-1 model function. The effects of communication noise and attitude errors are simulated by Monte Carlo methods, and the winds are recovered by both the Sum of Square (SOS) algorithm and a Maximum Likelihood Estimator (MLE). The SOS algorithm is shown to fail for light enough winds at all incidence angles and to fail to show areas of calm because backscatter estimates that were negative or that produced incorrect values of K sub p greater than one were discarded. The MLE performs well for all input backscatter estimates and returns calm when both are negative. The use of the SOS algorithm is shown to have introduced errors in the SASS-1 model function that, in part, cancel out the errors that result from using it, but that also cause disagreement with other data sources such as the AAFE circle flight data at light winds. Implications for future scatterometer systems are given.
Author

N85-10422# Montana Bureau of Mines and Geology, Butte.
A SUMMARY OF GEOTHERMAL STUDIES IN MONTANA, THROUGH 1983 Final Report
John L. Sonderegger 1984 62 p refs
(Contract DE-FC07-79ID-12033)
(DE84-014325; DOE/ID-12033/T4; MBMC-142) Avail: NTIS HC A04/MF A01

The geology, hydrology, and surface manifestations of geothermal systems in Montana are described by area. Water quality information, tables of inventory and water analysis data for springs and wells, and a geothermal resource map are included. DOE

N85-10423# Geological Survey, Laramie, Wyo.
GEOTHERMAL RESOURCES OF THE LARAMIE, HANNA, AND SHIRLEY BASINS, WYOMING
Bern S. Hinckley and Henry P. Heasler 1984 56 p refs
(Contract DE-FC07-79ID-12026)
(DE84-016104; DOE/ID-12026/T7; Rept-26) Avail: NTIS HC A04/MF A01

The occurrences of geothermal resources occur, the temperatures, distribution, and possible applications of geothermal resources in Wyoming are discussed. The State's thermal setting and the methods used in assessing the geothermal resources are described. The discussion of the geothermal resources of the Laramie, Hanna, and Shirley Basins includes material on heat flow and conductive gradients, stratigraphy and hydrology, structure and water movement, measured temperatures and gradients, areas of anomalous gradient (including the warm spring systems at Alcova and Saratoga), and temperatures of the Cloverly Formation. DOE

N85-10424# Texas Energy and Natural Resources Advisory Council, Austin.
GEOTHERMAL EXPLORATION IN TRANS-PECOS, TEXAS/NEW MEXICO Final Report
R. Roy, B. Taylor, and M. P. Miklas, Jr. Sep. 1983 129 p refs
(Contract DE-FC07-79ID-12080)
(DE84-015553; DOE/ID-12080/T1) Avail: NTIS HC A07/MF A01

Interest in alternative energy encouraged the investigation of possible geothermal resources in Trans Pecos, Texas/New Mexico in an area of extensive Cenozoic volcanism with several hot springs. Geochemical analysis of groundwater samples resulted in the definition of two major areas of geothermal interest: the Hueco Bolson in northeastern El Paso County, and the Presidio Bolson. Regional temperature gradient measurements also supported the existence of anomalies in these places, and showed another smaller anomaly in the Finlay Mountains, Hudspeth County. Detailed geophysical and geochemical studies were conducted on these three targets. DOE

N85-10425# California Univ., Berkeley. Lawrence Berkeley Lab. Center for Computational Seismology.
SEISMIC DISCRIMINATION OF A GEOTHERMAL FIELD: CERRO PRIETO
Sam Blakeslee Apr. 1984 9 p refs Presented at the Geothermal Resources Council Ann. Meeting, Reno, Nev., 26-29 Aug. 1984
(Contract DE-AC03-76SF-00098)
(DE84-014581; LBL-17859; CONF-840809-17) Avail: NTIS HC A02/MF A01

Extensive reprocessing of a subset of the seismic reflection data from Cerro Prieto was performed. The formations and faults identified in the resulting seismic profile were correlated to cross-sections constructed from well log data. The production region coincides with a zone of reflection attenuation. A detailed velocity analysis reveals a lid of high velocity events rimming the reflection attenuation zone. This may prove to be a valuable discriminant for locating a geothermal resource using seismic reflection data. DOE

N85-10426# Technische Univ., Berlin (West Germany). Project Safety-Studies Entsorgung.
DEFINITION OF GLOBAL DISPERSION COEFFICIENTS
Richard L. Naff Oct. 1983 42 p refs Sponsored by Bundesministerium fuer Forschung und Technologie
(PSE-83/4-B) Avail: NTIS HC A03/MF A01

Analysis of dispersive flux in porous media by the method of moments, and Taylor analysis of dispersion in unidirectional flow and of the global asymptotic dispersion tensor in three dimensions are described. Results suggest that the magnitude of a time-constant, global longitudinal dispersivity is decided by a vertical correlation length scale; a measure of variance of the medium; and either an average local transverse dispersivity or a ratio of vertical to horizontal length scales. The length scales depend on the theoretical covariance function used in the analysis. Recommendations concerning the estimation of the dispersivity of a particular aquifer are made. Author (ESA)

N85-10427# Anderson-Nichols and Co., Palo Alto, Calif. Resources Technology Div.
APPLICATION GUIDE FOR HYDROLOGICAL SIMULATION PROGRAM FORTRAN (HSPF) Final Report, Mar. 1981 - Sep. 1983
Anthony S. Donigian, Jr., John C. Imhoff, Brian R. Bicknell, and John L. Little, Jr. Jun. 1984 189 p refs
(Contract EPA-68-01-6207)
(PB84-215763; EPA-600/3-84-065) Avail: NTIS HC A09/MF A01 CSCL 08H

The Hydrological Simulation Program - FORTRAN (HSPF) is a set of computer codes that can simulate the hydrologic and associated water quality processes on pervious and impervious land surfaces, in the soil profile, and in streams and well-mixed impoundments. The entire application processes of HSPF is described. The decisions, procedures, and results that are involved in a typical application are demonstrated. Information given serves as a supplement to the user's guide. Author (GRA)

N85-10428# Nevada Univ., Reno. Water Resources Center.
HYDROGEOCHEMICAL INVESTIGATION OF THERMAL SPRINGS IN THE BLACK CANYON-HOOVER DAM AREA, NEVADA AND ARIZONA
W. Alan McKay and Douglas E. Zimmerman Nov. 1983 52 p

refs
(Contract DI-14-34-0001-2130)
(PB84-202472; PUB-41092; OWRT-A-100-NEV(a)) Avail: NTIS HC A04/MF A01 CSCL 13B

An estimated 80 liters/sec. of spring flow discharges from both sides of the Colorado River in Black Canyon, Nevada and Arizona. The spring issue primarily from the highly faulted and fractured volcanic rocks which are exposed throughout the canyon from Hoover Dam to 9.5 kilometers downstream. Chemical analysis of the spring waters, including environmental isotope and tritium results, indicate a variety of possible origins. Observed surface temperatures range from 24C to 62 C. Total dissolved solids values range from 500 mg/l to 3600 mg/l. The occasional absence of secondary mineral deposits suggests a potentially young system. GRA

N85-10429# Cornell Univ., Ithaca, N.Y. Dept. of City and Regional Planning.
MAJOR INSTITUTIONAL ARRANGEMENTS AFFECTING GROUND WATER IN NEW YORK STATE Final Report
Richard S. Booth and Albert Bronson Dec. 1983 133 p refs
(Contract DI-14-34-0001-3124)
(PB84-202506; OWRT-A-097-NY(1)) Avail: NTIS HC A07/MF A01 CSCL 13B

The major institutional arrangements in New York State relating to management of ground water resources in terms of use and quality are analyzed. The objectives are outlined and the project's strengths and limitations are discussed. A brief overview of the nature of ground water resources in New York State, the current use of those resources, and the current concerns about the quality and use of ground water resources are discussed. The major, formal institutional/legal arrangements of New York State and the federal government created for managing the quality and use of ground water are reviewed. The responses to a survey of county and district health offices are summarized. GRA

N85-10430# New Hampshire Univ., Durham. Water Resources Research Center.
UNCERTAINTY IN WATER RESOURCE PLANNING: AN ECONOMIC EVALUATION OF A WATER USE REDUCTION ALTERNATIVE
Bruce E. Lindsay and John R. Powell Apr. 1983 65 p refs
(Contract DI-14-34-0001-2131)
(PB84-202605; RR-41; OWRT-A-058-NH(2)) Avail: NTIS HC A04/MF A01 CSCL 13B

Water consumption in the residential sector for a New Hampshire community is discussed. When and where monetary costs accrued to water cutbacks occur in the residential sector, the effect of seasonal demand on shortage costs, and time as penalty factor in assessing the costs of shortage of varying quantity amounts are discussed. The methodology developed gives a community an individually tailored range of costs and losses for varying sizes of percentage cuts in water demand over varying time periods. Rather than tie shortage penalty costs to size of shortage in linear fashion, or develop a shortage penalty cost function that is based on three different levels of shortage in three different towns, the individualism of the community is emphasized. GRA

N85-10431# Geological Survey, Towson, Md. Water Resources Div.
WATER RESOURCES DATA, MARYLAND AND DELAWARE, WATER YEAR 1983 Annual Report, 1 Oct. 1982 - 30 Sep. 1983
Robert W. James, Jr., Robert H. Simmons, and Bernard F. Strain Apr. 1984 373 p Sponsored in part by Corps of Engineers and National Park Service
(PB84-225135; USGS-WDR-MD-DE-83-1;
USGS/WRD/HD-84/022) Avail: NTIS HC A16/MF A01 CSCL 08H

Water resources data for the 1983 water year for Maryland and Delaware consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and water levels and water quality of ground water wells. Records for water discharge at 98 gaging stations; stage and contents at 1 reservoir; water quality at 33 gaging stations and 325 wells; and water levels at 24 observation wells are given. Also included are data for 13 crest stage and 4 tidal crest stage partial record stations. Author (GRA)

N85-10432# Geological Survey, Sacramento, Calif. Water Resources Div.
WATER RESOURCES DATA, CALIFORNIA, WATER YEAR 1982. VOLUME 4: NORTHERN CENTRAL VALLEY BASINS AND THE GREAT BASIN FROM HONEY LAKE BASIN TO OREGON STATE LINE Annual Report, 1 Oct. 1981 - 30 Sep. 1982
R. P. Fogelman, J. R. Mullen, W. F. Shelton, and R. G. Simpson Mar. 1984 335 p Sponsored in part by Corps of Engineers, Bureau of Reclamation and Forest Service Prepared in cooperation with California State Dept. of Water Resources and other agencies
(PB84-225127; USGS-WDR-CA-82-4-Vol-4;
USGS/WRD/HD-84/021-Vol-4) Avail: NTIS HC A15/MF A01 CSCL 08H

Water resources data for the 1982 water year for California consists of records of stage, discharge and water quality of streams; stage and contents in lakes and reservoirs and water levels and water quality in wells. Discharge records for 163 gaging stations; stage and contents for 37 lakes and reservoirs; precipitation data for 2 stations; water quality for 7 stations; and water levels for 54 observation wells is given. Also included are 4 crest stage partial record stations and 4 low flow partial record stations. Author (GRA)

N85-10433# Geological Survey, Sacramento, Calif. Water Resources Div.
WATER RESOURCES DATA, CALIFORNIA, WATER YEAR 1982. VOLUME 2: PACIFIC SLOPE BASINS FROM ARROYO GRANDE TO OREGON STATE LINE EXCEPT CENTRAL VALLEY Annual Report, 1 Oct. 1981 - 30 Sep. 1982
K. L. Markham, V. Piro, W. F. Shelton, and M. W. Weston, Jr. Mar. 1984 422 p Sponsored in part by Corps of Engineers, National Park Service and Forest Service Prepared in cooperation with California State Dept. of Water Resources and other agencies
(PB84-224708; USGS-WDR-CA-82-2-Vol-2;
USGS/WRD/HD-84/020-Vol-2) Avail: NTIS HC A18/MF A01 CSCL 08H

Water resources data for the 1982 water year for California consists of records of stage, discharge, and water quality of streams; stage and contents in lakes and reservoirs; and water levels and water quality in wells. Discharge records for 153 gaging stations; stage and contents for 12 lakes and reservoirs; water quality for 19 stations; water levels for 79 observation wells are given. Also included are 1 low flow partial record station and 13 water quality partial record stations. Author (GRA)

N85-10434# Geological Survey, Jackson, Miss. Water Resources Div.
WATER RESOURCES DATA, MISSISSIPPI, WATER YEAR 1982 Annual Report, 1 Oct. 1981 - 30 Sep. 1982
C. H. Tate, E. J. Tharpe, G. A. Bednar, and W. T. Oakley Jun. 1984 355 p Sponsored in part by Corps of Engineers, National Weather Service and Soil Conservation Service Prepared in cooperation with Mississippi Dept. of Natural Resources and other agencies
(PB84-224559; USGS/WRD/HD-84/019) Avail: NTIS HC A16/MF A01 CSCL 08H

Water resources data for the 1982 water year for Mississippi consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water wells. Records of water discharge at 63 gaging stations; stage records for 18 of these gaging stations; stage only at 5 gaging stations; water quality for 26 gaging stations, and 71 wells; and water levels for 317 observation wells are given. Also included are peak discharge

data for 90 crest stage partial record stations and water quality data at 85 partial record or miscellaneous sites. GRA

N85-10435# Geological Survey, Richmond Va. Water Resources Div.
WATER RESOURCES DATA, VIRGINIA, WATER YEAR 1983 Annual Report, 1 Oct. 1982 - 30 Sep. 1983
Byron J. Prugh, Jr., Fred J. Easton, and Dennis D. Lynch May 1984 454 p Sponsored in part by Corps of Engineers and EPA Prepared in cooperation with Virginia State Water Control Board (PB84-224542; USGS/WRD/HD-84/030; USGS-WDR-VA-83-1) Avail: NTIS HC A20/MF A01 CSCL 08H

Water resources data for the 1983 water year for Virginia consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water wells. Records for water discharge at 196 gaging station; stage only at 1 gaging station; stage and contents at 10 lakes and reservoirs; water quality at 47 gaging stations and 2 wells; and water levels at 60 observation wells are given. Also included are data for 77 crest stage partial record stations. Author (GRA)

N85-10436# Geological Survey, Columbus, Ohio. Water Resources Div.
WATER RESOURCES DATA, OHIO, WATER YEAR 1983. VOLUME 2: ST. LAWRENCE RIVER BASIN STATEWIDE PROJECT DATA Annual Report, 1 Oct. 1982 - 30 Sep. 1983
Harold L. Shindel, Lawrence L. Stewart, and James R. Kolva 1984 193 p Sponsored in part by Corps of Engineers
(PB84-223676; USGS-WDR-OH-83-2-Vol-2; USGS/WRD/HD-84/025-Vol-2) Avail: NTIS HC A09/MF A01 CSCL 08H

Water resources data for the 1983 water year for Ohio consist of records of stage, discharge, and water quality of streams; stage and contents; and water quality of lakes and reservoirs; and water levels and water; quality of ground water wells. Records for water discharge at 135 gaging stations; stage and contents at 35 lakes and reservoirs; water quality at 24 gaging stations, 117 wells and 6 synoptic sites; and water levels at 168 observation wells are given. Also included are data from 70 crest stage partial record stations, 42 low flow partial record stations, and 10 miscellaneous sites. Author (GRA)

N85-10437# Geological Survey, Tallahassee, Fla. Water Resources Div.
WATER RESOURCES DATA, FLORIDA, WATER YEAR 1982. VOLUME 4: NORTHWEST FLORIDA Annual Report, 1 Oct. 1981 - 30 Sep. 1982
T. K. Allen, A. E. Alarez, L. L. Batts, and C. W. Calhoun Feb. 1984 324 p
(PB84-223445; USGS-WDR-FL-82-4; USGS/WRD/HD-84/015) Avail: NTIS HC A14/MF A01 CSCL 08H

Water resources data for the 1982 water year in northwest Florida include continuous or faily discharge for 59 streams, periodic discharge for 2 streams, miscellaneous discharge for 17 streams, peak discharge for 41 streams, and continuous or daily stage for 8 streams; continuous elevations for 4 lakes and periodic elevations for 26 lakes; continuous ground water levels for 38 wells, periodic ground water levels for 160 wells, and miscellaneous water level measurements for 264 wells; quality of water for 36 surface-water sites and for 108 wells. GRA

N85-10438# Iowa Univ., Iowa City. Inst. of Hydraulic Research.
HYDROLOGIC AND ECONOMIC MODELS FOR WATERSHED EVALUATION AND RESEARCH
David G. Carvey and Thomas E. Croley, II Jun. 1984 98 p refs Sponsored in part by Economic Research Service
(PB84-222371; IIHR-277) Avail: NTIS HC A05/MF A01 CSCL 08H

A distributed parameter hydrologic model and an optimizing economic model are joined to study watershed planning and management alternative encompassing competing economic and hydrologic (environmental) objectives. Agricultural and conservation management activities are allocated to optimize crop and rotation profits and runoff and soil loss reduction. Four multiobjective weighting schemes are used to generate 151 planning and management alternatives. The relative importance include objectives is determined by weights which represent potential preferences of decision makers. Major economic and environmental relationships are identified for the modeled watershed. The value path technique and land use maps are used as aids in interpreting multiobjective optimization results and solution response sensitivity to objective weights. GRA

N85-10439# East Carolina Univ., Greenville, N.C. Inst. for Coastal and Marine Resources.
ENVIRONMENTAL GEOLOGIC ATLAS OF THE NORTH CAROLINA COASTAL ZONE: DARE, HYDE, TYRRELL AND WASHINGTON COUNTIES
Craig G. Lukin and Lucy L. Mauger Nov. 1983 136 p refs
(PB84-222975; NOAA-84072312) Avail: NTIS HC A07/MF A01 CSCL 08F

The Albermarle-Pamlico peninsula of North Carolina includes Dare, Hyde, Tyrell, and Washington counties. The peninsula is a low lying, tidewater region bordered on the north by the Albemarle Sound and on the east and south by the Pamlico Sound and Palico River. In addition, Dare and Hyde counties include a portion of the barrier island system that is about 120 miles in length. The area is characterized by poorly integrated coastal streams, organic soils, extensive swamp forests, marshes, and evergreen wetlands, nd a low astronomical tidal range. The environmental geologic atlas of the North Carolina coastal zone consists of a text that is a summary of published and unpublished data on this portion of the North Carolina coastal region and more than 250 large-scale (1:24,000) overlay maps (and keys) that are separate from the text. GRA

N85-10440# Geological Survey, Augusta, Maine. Water Resources Div.
WATER RESOURCES DATA FOR MAINE, WATER YEAR 1983 Annual Report, 1 Oct. 1982 - 30 Sep. 1983
R. A. Morrill, C. R. Haskell, J. T. Adamik, and W. B. Higgins Apr. 1984 163 p
(PB84-225143; USGS-WDR-ME-83-1; USGS/WRD/HD-84/023) Avail: NTIS HC A08/MF A01 CSCL 08H

Water discharge records for 56 gaging stations; stage only for 2 gaging stations; contents for 17 lakes and reservoirs; water quality for 11 gaging stations; and water levels for 32 observation wells. Additional water data are collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. GRA

N85-10441# Geological Survey, Columbus, Ohio. Water Resources Div.
WATER RESOURCES DATA FOR OHIO, WATER YEAR 1983. VOLUME 1: OHIO RIVER BASIN Annual Report, 1 Oct. 1982 - 30 Sep. 1983
H. L. Shindel, L. L. Stewart, and J. R. Kolva 1984 350 p Sponsored in part by Corps of Engineers
(PB84-224690; USGS/WRD/HD-84/024-Vol-1; USGS-WDR-OH-83-1-Vol-1) Avail: NTIS HC A15/MF A01 CSCL 08H

Records are presented for water discharge at 135 gaging stations; stage and contents at 35 lakes and reservoirs; water quality at 24 gaging stations, 117 wells and 6 synoptic sites; and water levels at 168 observation wells. Also included are data from 70 crest stage partial record stations, 42 low flow partial record stations, and 10 miscellaneous sites. GRA

N85-10442# Geological Survey, Lansing, Mich. Water Resources Div.
WATER RESOURCES DATA FOR MICHIGAN, WATER YEAR 1983 Annual Report, 1 Oct. 1982 - 30 Sep. 1983
J. B. Miller, J. L. Oberg, and T. Sieger, Jr. Feb. 1984 302 p Sponsored in part by Corps of Engineers, National Weather Service, EPA and National Park Service

(PB84-225176; USGS-WDR-MI-83-1; USGS/WRD/HE-84/016) Avail: NTIS HC A14/MF A01 CSCL 08H

Water resources data for the 1983 water year for Michigan consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water temperature of ground water. This report contains discharge records for 143 gaging stations; stage only records for 3 gaging stations; stage and contents for 5 lakes and reservoirs; water quality for 33 continuous record stations; and water levels for 53 observation wells. Also included are 74 crest stage partial-record stations and 8 low flow partial record stations. GRA

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N85-10443# Naval Research Lab., Washington, D. C.
STUDIES OF HYDROGENATED AMORPHOUS SILICON Annual Report
S. G. Bishop and W. E. Carlos Jul. 1984 48 p refs
(Contract DE-AI02-80C5-83116)
(DE84-013038; SERI/STR-211-2393) Avail: NTIS HC A03/MF A01

The defect structure and bonding of hydrogenated amorphous silicon films which use nuclear magnetic resonance (NMR) and electron spin resonance (ESR) was investigated. Phosphorus NMR chemical shift measurements yielded a ratio of threefold to fourfold P-sites. Various resonance lines were observed in heavily boron and phosphorus doped films and a-SiC:H alloys. The ESR on low pressure chemical vapor deposited (LPCVD) a-Si:H were measured. The ESR spectrum of LPCVD-prepared films was not affected by prolonged exposure to strong light. Microcrystalline silicon samples were examined. The phosphorus doped films showed a strong signal from the crystalline material and no resonance from the amorphous matrix. It is shown that phosphorus is incorporated in the crystals and is active as a dopant. No signal is recorded from boron doped films. E.A.K.

N85-10444*# Hughes Aircraft Co., El Segundo, Calif.
ADVANCED NICKEL-HYDROGEN CELL CONFIGURATION STUDY Final Report
E. Adler and F. Perez Oct. 1984 74 p refs
(Contract NAS3-22249)
(NASA-CR-174775; NAS 1.26:174775; E9787) Avail: NTIS HC A04/MF A01 CSCL 10C

Three nickel hydrogen battery designs, individual pressure vessel (IPV), common pressure vessel (CPV), and a bipolar battery module were studied. Weight, system complexity and cost were compared for a satellite operating in a 6 hour, 5800 nautical mile orbit. The required energy storage is 52 kWh. A 25% improvement in specific energy is observed by employing a bipolar battery versus a battery comprised of hundreds of IPV's. Further weight benefits are realized by the development of light weight technologies in the bipolar design. E.A.K.

N85-10445*# Cleveland State Univ., Ohio.
MANUAL OF PHOSPHORIC ACID FUEL CELL POWER PLANT OPTIMIZATION MODEL AND COMPUTER PROGRAM Final Report
Cheng-yi Lu and Kalil A. Alkasab May 1984 66 p refs
(Contracts NCC3-17; DE-AI21-80ET-17088)
(NASA-CR-174721; DOE/NASA/0017-3; NAS 1.26:174721) Avail: NTIS HC A04/MF A01 CSCL 10B

An optimized cost and performance model for a phosphoric acid fuel cell power plant system was derived and developed into a modular FORTRAN computer code. Cost, energy, mass, and electrochemical analyses were combined to develop a mathematical model for optimizing the steam to methane ratio in the reformer, hydrogen utilization in the PAFC plates per stack. The nonlinear programming code, COMPUTE, was used to solve this model, in which the method of mixed penalty function combined with Hooke and Jeeves pattern search was chosen to evaluate this specific optimization problem. Author

N85-10446*# Solarex Corp., Rockville, Md.
PROCESS RESEARCH OF POLYCRYSTALLINE SILICON MATERIAL (PROPSM) Quarterly Report, 6 Nov. 1983 - 31 Dec. 1983
J. S. Culik 31 Dec. 1983 19 p refs Prepared for JPL Sponsored in part by DOE
(Contract JPL-956698)
(NASA-CR-173838; JPL-9950-935; NAS 1.26:173838; DOE/JPL-956698-84/1; QR-1) Avail: NTIS HC A02/MF A01 CSCL 10A

Recent reported results of hydrogen-passivated polycrystalline silicon solar cells are summarized. Most of the studies have been performed on very small grain or short minority-carrier diffusion length silicon. Hydrogenated solar cells fabricated from this material appear to have effective minority-carrier diffusion lengths that are still not very long, as shown by the open-circuit voltages of passivated cells that are still significantly less than those of single-crystal solar cells. The short-circuit current of solar cells fabricated from large-grain cast polycrystalline silicon is nearly equivalent to that of single-crystal cells, which indicates long bulk monitority-carrier diffusion length. However, the open-circuit voltage, which is sensitive to grain boundary recombinaton, is 20 to 40 mV less. The goal of this program is to minimize the variations in open-circuit voltage and fill-factor that are caused by structural defects by passivating these defects using a hydrogenation process. Author

N85-10447*# Cleveland State Univ., Ohio.
MANUAL OF PHOSPHORIC ACID FUEL CELL STACK THREE-DIMENSIONAL MODEL AND COMPUTER PROGRAM Final Report
Cheng-yi Lu and Kalil A. Alkasab May 1984 66 p refs
(Contracts NCC3-17; DE-AI21-80ET-17088)
(NASA-CR-174722; DOE/NASA/0017-4; NAS 1.26:174722) Avail: NTIS HC A04/MF A01 CSCL 10B

A detailed distributed mathematical model of phosphoric acid fuel cell stack have been developed, with the FORTRAN computer program, for analyzing the temperature distribution in the stack and the associated current density distribution on the cell plates. Energy, mass, and electrochemical analyses in the stack were combined to develop the model. Several reasonable assumptions were made to solve this mathematical model by means of the finite differences numerical method. Author

N85-10448# Department of Energy, Washington, D. C.
LIQUID COOLED, LINEAR FOCUS SOLAR CELL RECEIVER Patent Application
Aaron S. Kirpich, inventor (to DOE) Filed 8 Dec. 1983 29 p
(Contract DE-AC04-80ET-20627)
(DE84-014446; US-Patent-Appl-SN-559504) Avail: NTIS HC A02/MF A01

Separate structures for electrical insulation and thermal conduction which are established within a liquid cooled, linear focus solar cell receiver for use with parabolic or Fresnel optical concentrators are discussed. The receiver includes a V shaped aluminum extrusion with a pair of outer faces each formed with a channel receiving a string of solar cells in thermal contact with the extrusion. Each cell string is attached to a continuous glass cover secured within the channel with spring clips to isolate the string from the external environment. Repair or replacement of solar cells is effected simply by detaching the spring clips to remove

the cover/cell assembly without interrupting circulation of coolant fluid through the receiver. The lower surface of the channel in thermal contact with the cells of the string is anodized to establish a suitable standoff voltage capability between the cells and the extrusion. Primary electrical insulation is provided by a dielectric tape disposed between the coolant tube and extrusion. Adjacent solar cells are soldered to interconnect members designed to accommodate thermal expansion and mismatches. The coolant tube is clamped into the extrusion channel with a releasable attachable clamping strip to facilitate easy removal of the receiver from the coolant circuit. DOE

N85-10449# Technical Planning, Inc., Bethesda, Md.
SOLAR HEATING AND COOLING R AND D PROGRAM COORDINATION SUPPORT Final Report, 1 Oct. 1980 - 30 Sep. 1983
Jan. 1984 25 p refs
(Contract DE-AC03-80CS-30512)
(DE84-013479; DOE/CS-30512/T1) Avail: NTIS HC A02/MF A01

International research and development activities in solar heating and cooling are discussed. The cooperative programs were of two types: bilateral and multilateral. The multilateral programs supported under this contract were: International Energy Agency Solar Heating and Cooling Program; and NATO/CCMS Solar Energy Pilot Study. Solar heating and cooling projects under the following bilateral programs were supported: US/Mexico; US/Israel; and US/Spain. The assistance to solar heat technologies, consisted primarily of program management and coordination support, plus a smaller amount of technical support. The work performed during the 3 years of this contract and the accomplishments are summarized. DOE

N85-10450# Physical Sciences, Inc., Andover, Mass.
HOT-GAS CLEANUP FOR MOLTEN CARBONATE FUEL CELLS-DECHLORINATION AND SOOT FORMATION Final Report, May 19, 1981 - July 19, 1983
D. Ham, A. Gelb, G. Lord, and G. Simons Jan. 1984 127 p refs
(Contract DE-AC21-81MC-16242)
(DE84-003072; DOE/MC-16242/1554) Avail: NTIS HC A07/MF A01

Two separate aspects of hot-gas conditioning for molten carbonate fuel cells (MCFC) were investigated: potential high temperature chloride sorbent materials were screened and tested and carbon deposition on MCFC components was studied experimentally to determine guidelines for maximizing MCFC efficiency while avoiding carbon fouling. Natural minerals containing sodium carbonate were identified as the most promising candidates for economical removal of chlorides from coal gasifier effluents at temperatures of about 800 K (980 F). The mineral Shortite was tested in a fixed bed and found to perform remarkably well with no calcination. Measurements showed that carbon deposition can occur in the equilibrium carbon free region because of the relative rates of the relevant reactions. On all surfaces tested, the Boudouard carbon formation reaction is much faster than the water-gas shift reaction which is much faster than the methanation reaction. This means that the normal practice of adding steam to prevent carbon formation will only succeed if flows are slow enough for the water shift reaction to go substantially to completion. More direct suppression of carbon formation can be achieved by CO2 addition through anode recycle to force the Boudouard reaction backward. DOE

N85-10451# Sandia Labs., Livermore, Calif. Solar Components Div.
TECHNICAL REVIEW OF THE SOLID PARTICLE RECEIVER PROGRAM
Patricia K. Falcone, comp. Jul. 1984 47 p Meeting held in Livermore, Calif., 25-26 Jan. 1984
(Contract DE-AC04-76DR-00789)
(DE84-015181; SAND-84-8229) Avail: NTIS HC A03/MF A01

The use of solid particles as the working fluid and storage medium in solar central receivers is one approach to delivering solar energy at temperatures above the nominal 550 C (1100 F) peak of current water-steam and molten salt central receiver technologies. The technical feasibility of the solid particle concept is the subject of an ongoing examination at Sandia National Laboratories Livermore (SNLL). A review of the individual investigations in this program was conducted. The meeting was held to discuss the status of the technical feasibility investigations one year into this phase of study and to set direction for the future. Summaries of each of the individual presentations at the review meeting, as well as an overview of the program are presented. DOE

N85-10452# Pacific Northwest Lab., Richland, Wash.
SUMMARY OF TRENDS IN PHOTOVOLTAIC PATENT ACTIVITY
L. C. Levine Jun. 1984 25 p refs
(Contract DE-AC06-76RL-01830)
(DE84-015757; PNL-5150) Avail: NTIS HC A02/MF A01

Information on patent activity for inventions concerning photovoltaic cell technology is given. Such information can aid in the assessment of the status and direction of technological development. A total of 729 US patents that issued between mid-1962 and the end of 1982, were individually examined and classified into several technical categories. Computerized analysis of trends in patent activity among major technical categories was performed. The level of inventive activity increased dramatically in the mid-1970's. It appears to have peaked in 1978 and remained steady through 1980. The data indicates that, beginning in 1978, an increasing proportion of inventions were among approaches other than the conventional Cz type cells, specifically thin film and concentrator cells. Thin film and Cz type photovoltaic cells represent two thirds of the patents analyzed. Among thin film patents, silicon and cadmium containing cells represent about two thirds of the patents analyzed. Further insight into recent trends could be obtained by adding more recently issued patents to the data base. DOE

N85-10453# Puerto Rico Univ., Mayaguez. Center for Energy and Environment Research.
VARIABLE GEOMETRY DARRIEUS WIND MACHINE
J. T. Pytlinski and D. Serrano Aug. 1983 15 p refs Presented at the 1983 Solar World Congr., Perth, Australia, 14-19 Aug. 1983 Sponsored in part by DOE
(PB84-207281; CEER-S-178) Avail: NTIS HC A02/MF A01 CSCL 10A

A variable geometry Darrieus wind machine is proposed. The lower attachment of the blades to the rotor can move freely up and down the axle allowing the blades of change shape during rotation. Experimental data for a 17 m. diameter Darrieus rotor and a theoretical model for multiple streamtube performance prediction were used to develop a computer simulation program for studying parameters that affect the machine's performance. This new variable geometry concept is described and interrelated with multiple streamtube theory through aerodynamic parameters. The computer simulation study shows that governor behavior of a Darrieus turbine can not be attained by a standard turbine operating within normally occurring rotational velocity limits. A second generation variable geometry Darrieus wind turbine which uses a telescopic blade is proposed as a potential improvement on the studied concept. GRA

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N85-10454# Council for Scientific and Industrial Research, Pretoria (South Africa). National Committee for Oceanographic Research.
THE SANCOR ESTUARIES PROGRAMME, 1982-1986

Feb. 1983 50 p
(ISBN-0-7988-2662-2; Rept-67) Avail: NTIS HC A03/MF A01

The South African National Committee for Oceanographic Research (SANCOR) esturaries program is discussed. Control and legislation, past and present research in the areas of biology, chemistry, geology, sedimentology, and aquaculture are discussed. R.J.F.

N85-10455# Council for Scientific and Industrial Research, Pretoria (South Africa). National Committee for Oceanographic Research.

THE SANCOR PROGRAMME ON COASTAL PROCESSES, APRIL 1982 - MARCH 1988

D. H. Swart, ed. Feb. 1984 38 p
(Rept-68; ISBN-0-7988-2663-0) Avail: NTIS HC A03/MF A01

The South African National Committee for Oceanographic Research (SANCOR) program for the study of coastal processes is described. The program was drawn up by active researchers in the field and by executives responsible for management in the coastal zone. An integrated systems approach is recommended within which physical, chemical and biological aspects and their interactions are to be studied. Processes are identified in terms of input/output to and from the coastal zone, external driving forces (including human interference), basic features (including habitat features) and the responses and interactions within the zone. Priorities for research are recommended. In defining these priorities, emphasis is given to the study of those factors which are most needed for the understanding of the coastal zone as a whole with particular reference to those factors which will aid the understanding of the effect on the environment of human interference. Author

N85-10456# Council for Scientific and Industrial Research, Pretoria (South Africa).

MINERAL NUTRIENTS IN MEDITERRANEAN ECOSYSTEMS

J. A. Day, ed. Jun. 1983 171 p Workshop held at Hermanus, South Africa, Sep. 1980
(Rept-71; ISBN-0-7988-2693-2) Avail: NTIS HC A08/MF A01

Mediterranenn ecosystems have become major testing grounds for the concept of ecological convergence. The very problem of generalizing from individual ecosystem studies led to a dual program in the United States-International Biological Program (US-IBP), where intensive site studies of ecosystem functioning were paralleled by intercontinental comparisons of the origin and structure of ecosystems. Convergent evolution in mediterranean Chile and California, the results of which provided substantial support for the convergence hypothesis were investigated. Subsequent work, however, has shown clear differences between the structure, and apparently the functions, of mediterranean ecosystems of the Mediterranean Basin and the New World on the one hand, and those of Australia and South Africa on the other: differences which are ascribed partly to divergent evolutionary histories and partly to the marked differences in nutrient status. Author

N85-10457*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

SPACE SHUTTLE ENVIRONMENTAL EFFECTS: THE FIRST 5 FLIGHTS

Andrew Potter, ed. Jul. 1983 285 p refs Proc. held at Kennedy Space Center, Fla., 14-16 Dec. 1982
(Contract NAS9-15800)
(NASA-CR-171812; JSC-19091; NAS 1.26:171812; LEMSCO-19083) Avail: NTIS HC A13/MF A01 CSCL 13B

Environmental effects associated with the first five Space Shuttle flights were monitored by the National Aeronautics and Space Administration (NASA) and the U.S. Air Force (USAF). Results and interpretations from this effort were reported at the December 1982 joint NASA-USAF conference. The conference proceedings are presented in this document. Most of the monitoring activity was focused on the launch cloud, emphasizing surface effects on the biota and air quality, model prediction of surface concentrations of HCl gas and Al2O3 dust, and airborne measurements of cloud composition. In general, assessments and predictions made in the April 1978 Final Environmental Impact Statement for the Space Shuttle Program were verified. Fallout of acidic mist and dust within 3 mi to 5 mi of the launch pad was the only unexpected effect of the launch. Atomization of deluge water in the Shuttle exhaust is considered to be the most probable cause of this effect. Sonic booms were monitored for several landings at Edwards Air Force Base, California; results agreed well with model predictions. Author

N85-10458*# National Aeronautics and Space Administration, Washington, D. C.

STUDY OF ANNOYANCE DUE TO URBAN AUTOMOBILE TRAFFIC

D. Aubree, S. Auzou, and J. M. Rapin Jul. 1984 73 p refs Transl. into ENGLISH of "Etude de la Gene due au Trafic Automobile Urbain" rept. Centre Scientifique et Technique du Batiment, Paris, Jun. 1971 p 1-76 Original language document was announced as N80-73319 Transl. by Kanner (Leo), Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77514; NAS 1.15:77514) Avail: NTIS HC A04/MF A01 CSCL 13B

Continuous traffic noise measurements were carried out over 48 hour periods in front of a hundred buildings in different types of streets in Paris and its suburbs. Physical interpretation of the results provides a noise prediction formula for a traditional type of street. The noise at each point was characterized by a limited number of parameters by means of factor analysis, and their effect on the degree of disturbance by 700 individuals questioned near the measurement stations was studied. It was found that many additional factors affect disturbance besides noise, and that the dispersion of replies for any given noise situation is very wide. A disturbance index is proposed which takes into account the daylight level L(50), the position of rooms in the dwelling exposed to noise, and the individual degrees of satisfaction with the area. Author

N85-10459# Florida Univ., Gainesville. Dept. of Plant Pathology.

AQUATIC PLANT CONTROL RESEARCH PROGRAM. EVALUATION OF FUSARIUM ROSEUM CULMORUM AS A BIOLOGICAL CONTROL AGENT FOR HYDRILLA VERTICILLATA Final Report

R. Charudattan, T. E. Freeman, R. E. Cullen, and F. M. Hofmeister Aug. 1984 48 p
(Contract DACW39-76-C-0097)
(AD-A145228; WES-TR-A-84-5) Avail: NTIS HC A03/MF A01 CSCL 06/6

An isolate of Fusarium roseum Culmorum was isolated in 1974 from diseased stratiotes aloides (Hydrocharitaceae) plants found in New Wageningen, The Netherlands. In laboratory tests conducted in Gainesville, it was found to be pathogenic to a relative of S. aloides, Hydrilla verticillata, one of the most important aquatic plants in Florida. Hydrilla plants grown in different kinds of sterile water in containers ranging from 50-ml tubes to 20-pound aquarium tanks were killed following addition of macroconidial suspensions of this isolate and incubation for several weeks. A minimum of 25,000 conidia/ml of treated water were required to kill hydrilla. The host range of the Dutch Culmorum isolate was tested on 80 plant species including corp cultivars and nontarget aquatic plants. Seed infestation and/or seedling inoculation methods were used. Results indicated that the fungus infected some nontarget hosts, but was not a significant primary pathogen of any of the terrestrial hosts tested. It was lethal to certain aquatic plants, which also may be controlled by this isolate. The fungus survived in water or moist soil for at least 9 weeks, but the number of propagules in water declined to a low level during this period. The fungus was harmless to mosquitofish in an acute toxicity bioassay. A fungicide capable of controlling this fungus was identified. GRA

N85-10460# San Diego State Univ., Calif. Systems Ecology Research Group.

RESPONSE OF ARCTIC ECOSYSTEMS TO ELEVATED CARBON DIOXIDE REGIMES, VOLUME 2 Progress Report, 1 Jul. 1984 - 30 Jun. 1986

Walter C. Oechel 1984 260 p refs
(Contract DE-AC03-82ER-60079)
(DE84-015238; DOE/ER-60079/T6-Vol-2) Avail: NTIS HC A12/MF A01

The goal of the project is to establish the effects of medium and long term field manipulations of CO2 in northern ecosystems so that total system interactions can be evaluated and the effect of elevated CO2 levels on carbon accumulation and species composition determined. The results of a workshop on the measurement and modeling of the effects of elevated atmospheric CO2 on natural ecosystems, and progress in studies of the response of arctic ecosystems to elevated carbon dioxide regimes are given. DOE

N85-10461# Argonne National Lab., Ill.

STATE OF KNOWLEDGE OF ENVIRONMENTAL CONCERNS RELATED TO NATURAL GAS-FUELED VEHICLES

M. K. Singh Apr. 1984 64 p refs
(Contract W-31-109-eng-38)
(DE84-015894; ANL/CNSV-TM-138) Avail: NTIS HC A04/MF A01

Vehicles powered by natural gas (NG) are currently used in the United States and other parts of the world. While the number of such vehicles in the U.S. is small, the potential exists for substantial growth. For that reason and because NG-fueled vehicles have different performance, emissions, and safety characteristics than do gasoline- or diesel-fueled vehicles, this study was conducted to document environment concerns related to NG vehicle emissions and safety. Compared to gasoline-fueled vehicles, NG-fueled vehicles emit significantly less CO, more total HC, and less nonmethane HC; NO sub x emissions can be higher or lower. In addition, dual-fuel vehicles operating on gasoline may emit higher levels of pollutants than the baseline gasoline vehicles. In regard to safety, NG-fueled vehicles were found to have increased risks relative to gasoline-fueled vehicles in some cases, but to be relatively safe in other cases. No nationally recognized safety regulations or standards exist for NG vehicles, although the National fire Protection Association is now developing a set of standards. DOE

N85-10462# Oak Ridge National Lab., Tenn. Energy Div.

DEMONSTRATING AIR QUALITY IMPROVEMENTS: A REVIEW OF ALTERNATIVES

Donald B. Hunsaker, Jr. 1984 15 p refs Presented at the Air Pollution Control Association Ann. Meeting, San Francisco, 25 Jun. 1984
(Contracts DE-AC05-84OR-21400; W-7405-eng-26)
(DE84-014274; CONF-840612-14) Avail: NTIS HC A02/MF A01

The 1977 Clean Air Act Amendments specify that emissions data should be used to demonstrate improvements in air quality. This annual determination is known as demonstrating reasonable further progress (RFP) towards attaining the National Ambient Air Quality Standards. Data types and analysis techniques are evaluated as alternative mechanisms for demonstrating RFP. Further, the suitability of emission and ambient data as RFP indices are examined and the use of time series analysis as an alternative to plotting data on an RFP schedule is discussed. DOE

N85-10463# Oak Ridge National Lab., Tenn. Environmental Sciences Div.

SOLUTION OF CONTAMINANT TRANSPORT EQUATIONS USING AN ORTHOGONAL-UPSTREAM FINITE ELEMENT SCHEME

G. T. Yeh 1984 15 p refs Presented at the 5th Intern. Conf. on Finite Elements in Water Resources, Burlington, Vt., 18 Jun. 1984
(Contract DE-AC05-84OR-21400)
(DE84-014266; CONF-840688-2) Avail: NTIS HC A02/MF A01

An orthogonal-upstream weighting finite element scheme, which results in a matrix amenable to successive over-relaxation (SOR) solution strategies, is presented for approximating the contaminant transport equation in subsurface media. This scheme differs from the standard Galerkin and non-orthogonal-upstream weighting schemes in that the set of weighting functions is required to be orthogonal to the set of basis functions. These weighting functions are referred to as orthogonal-upstream weighting functions and are developed for line, quadrilateral, and triangular elements. Numerical results were obtained for two examples and are compared with results obtained with analytical solutions and the Galerkin and/or non-orthogonal-upstream weighting schemes. It is found that the direct elemination solutions of the orthogonal-upstream finite element equations yield results comparable to those obtained by the direct solution of the Galerkin and/or non-orthogonal-upstream weighting finite element equations. R.S.F.

N85-10464# Washington Univ., Seattle. Fisheries Research Inst.

ECOLOGY OF ESTUARINE CHANNELS OF THE PACIFIC NORTHWEST COAST: A COMMUNITY PROFILE

C. A. Simenstad Dec. 1983 195 p refs
(PB84-209709; FWS/OBS-83/05; LC-83-600586) Avail: NTIS HC A09/MF A01 CSCL 08A

This report on the estuarine channel babitats of the Pacific Northwest is one of a series of community profiles that synthesize useful information about specific natural coastal habitats. The geomorphological, hydrological, chemical, and biological components and natural processes of the channels, their energy interchange, and interactions among adjacent habitats are profiled. In combination these habitat components and their interactions dictate the ecological structures and fuctions of the channels. Considerations for habitat management are identified. GRA

N85-10465# Rutgers - The State Univ., New Brunswick, N. J. Center for Coastal and Environmental Studies.

RESPONSE OF ALGAL POPULATIONS TO CHANGES IN STREAM WATER QUALITY Final Report

Francesco B. Trama Feb. 1984 24 p refs
(Contract DI-14-34-0001-1132)
(PB84-202464; OWRT-A-061-NJ(1)) Avail: NTIS HC A02/MF A01 CSCL 14B

A custom-made dialysis cell and commercially available clear plastic chamber (Biomonitor) with a semipermeable membrane were tested as potentially more useful and reliable than the closed flasks employed in the widely adopted EPA Algal Assay; Bottle Test procedure. The dialysis cell failed to attain equilibrium with an external medium within a 60 hour period. The Biomonitor attained equilibrium within 60 hours but not with respect to soluble inorganic phosphorus. The growth response of natural plankton or a green alga, Selanastrum capricomutum, in Biomonitors under laboratory and in situ conditions showed that the Biomonitor producted results which were more variable and erratic than those obtained using a modified Algal Assay; Bottle Test procedure. Biomonitors proved to be more costly to use, less reliable, and subject to greater variation than the closed flask procedure. GRA

N85-10466# National Academy of Sciences - National Research Council, Washington, D. C. Commission of Physical Sciences, Mathematics and Resources.

ACID DEPOSITION: PROCESSES OF LAKE ACIDIFICATION Final Report

5 Mar. 1984 20 p Proc. of Discussion held in Washington, D.C., 5 Mar. 1984 Sponsored in part by EPA
(PB84-216175) Avail: NTIS HC A02/MF A01 CSCL 08H

A general acidification hypothesis was described as a sequential process in three steps: (1) sulfur deposition increases; (2) sulfate concentrations in streams and lakes increase; (3) concentrations of protolytic and nonprotolytic cations increase. The increases in protolytic cations cause decreases in stream and lake alkalinity. Questions posed by EPA are discussed including: have lakes and streams become more acidic over the last 15 years; to what extent have lakes and streams been acidified by acid deposition as opposed to other factors; what processes

control surface water acidity; are monitoring programs appropriate and warranted for detecting changes that might take place. GRA

N85-10467# Maryland Univ., College Park. Water Resources Research Center.
EROSION AND SEDIMENTATION CHRONOLOGY OF THREE WATERSHEDS IN MARYLAND
A. V. Segovia, J. D. Foss, D. Fanning, and G. Demas Aug. 1983 133 p refs
(Contract DI-14-34-0001-2122)
(PB84-207356; OWRT-A-058-MD(1)) Avail: NTIS HC A07/MF A01 CSCL 08M

Three small watersheds located in the Piedmont and Eastern Shore of Maryland were studied. The investigation included descriptions of residual and depositional soils. Buried soil horizons were dated by Carbon-14. In addition, phytoliths were studied to identify the vegetation contemporaneous with the deposition of soil levels. The presence of vertical successions of soil profiles indicate that rates of erosion and redeposition of soils varied in the last thousand years. Noticeable soil horizons were formed during long periods of slow erosion and little deposition, following short intervals of fast erosion and redeposition. Soil erosion was strong after the European contact, as a result of deforestation and intensive agricultural use of the land. The presence of corn phytoliths in this part of the section and the scarcity of grass phytolith suggest that erosion was caused by slash-burn methods of agriculture. GRA

N85-10468# Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
THE USE OF FIXED-BED ADSORBER MODELS TO PREDICT THE FLUXES OF TOXIC SUBSTANCES IN GROUNDWATERS AND SOIL ENVIRONMENTS Project Completion Report, 1 Oct. 1981 - 30 Sep. 1983
Walter J. Weber, Jr. 15 Jan. 1984 98 p refs
(Contract DI-14-34-0001-2124)
(PB84-202563; OWRT-A-122-MICH(1)) Avail: NTIS HC A05/MF A01 CSCL 13B

Effective management of a ground water system requires description and prediction of the transport and fate of contaminants in that system. This can be facilitated by using mathematical models which accurately represent the physical phenomena operative in the system. One of the most significant phenomena impacting the transport of many organic pollutants is partitioning between the solid (soil) and aqueous (ground water) phases. Data collected for four sands and lindane indicate that equilibrium sorption is a nonlinear function best fit by the Freundlich isotherm. Results collected from completely mixed batch reactors of the bottle and stirred type indicate that sorption of lindane on the soils investigated is a kinetically controlled phenomena. These kinetic sorption data may be mathematically modeled in a number of ways with the Michigan Adsorption Design and Applications Model (MADAM) demonstrating good agreement with measured data. GRA

N85-10469# Office of Technology Assessment, Washington, D.C.
ACID RAIN AND TRANSPORTED AIR POLLUTANTS: IMPLICATIONS FOR PUBLIC POLICY
Jun. 1984 331 p refs
(PB84-222967; LC-84-601073; OTA-O-204) Avail: NTIS HC A15/MF A01 CSCL 13B

What is known about pollutant emissions, movements, and effects and estimates of the risk of potential damages of resources are synthesized. The public policy of implications of the acid rain problems and estimates of the costs and potential effectiveness of various control options are given. Acid rain, ozone, and fine particles in the air are endangering US resources, but controlling these pollutants will be expensive. These air pollutants harm lakes and streams lower crop yields, damage manmade materials, decrease visibility and pose a threat to forests and human health. The costs to control these pollutants include higher electricity rates, fewer jobs for high sulfur coal miners and financial strain to utilities and industries. Acid rain and other transported air pollutants pose a special problem for policymakers: how to balance the concerns of those who bear the risk of damage with those who will pay for the control. Scientific uncertainty about many aspects of the problem complicates the decision of whether or when to control. Additional scientific research will not provide an unambiguous answer in the near future, nor will it ever resolve value conflicts. Author (GRA)

N85-10470# Municipal Environmental Research Lab., Cincinnati, Ohio.
REVERSE OSMOSIS TREATMENT TO CONTROL INORGANIC AND VOLATILE ORGANIC CONTAMINATION
Thomas J. Sorg and O. Thomas Love, Jr. Jul. 1984 24 p refs
(PB84-223528; EPA-600/D-84-198) Avail: NTIS HC A02/MF A01 CSCL 13B

Because of the versatility of reverse osmosis for removing a wide range of contaminants, U. S. EPA (Drinking Water Research Division) conducted laboratory and field studies to determine its effectiveness on specific inorganic and organic contaminants of concern to the water supply industry. Laboratory and field studies for the removal of specific inorganic contaminants showed that most of the contaminants listed in the EPA drinking water regulations are highly rejected (greater than 80%) while a few contaminants, such as fluoride, nitrate, and arsenic III, are only moderately rejected. Also, tests with different membranes showed only minor differences in removals. Laboratory studies using cellulose and nylon amide membranes showed less than 25% rejection of volatile organic compounds. A thin film composite membrane, on the other hand looked very encouraging in short duration (less than 4 hours) tests. Author (GRA)

N85-10471# Environmental Protection Agency, Ann Arbor, Mich. Technical Support Staff.
SIZE SPECIFIC TOTAL PARTICULATE EMISSION FACTORS FOR MOBILE SOURCES
Robert I. Bruetsch Jun. 1984 73 p refs
(PB84-226853; EPA-AA-TSS-PA-84-4) Avail: NTIS HC A04/MF A01 CSCL 13B

The purpose is to provide a methodology with which to project area wide total particulate emissions from mobile sources in a given calendar year. Particulate emissions can consist of lead salts, organics and sulfate emissions. The relative amounts vary for different vehicle types, emission control strategies and vehicle operating modes. Analysis of lead particulate indicates that most of the exhausted lead appears as PbC1Br. Therefore estimates of the mass lead particulate will be considerably larger than those predicted by the lead document. Organic emissions include both soluble organics and elemental carbon and are important contributors to total particulate emissions from all vehicles especially diesels. Sulfate emissions, mostly from unleaded gasoline fueled vehicles equipped with catalysts, are also important contributors to total vehicular particulate emissions. Author (GRA)

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N85-10472 Bayerische Akademie der Wissenschaften, Munich (West Germany). Geodaetische Kommission.
ANALYSIS OF HIGHLY PRECISE GRAVITY MEASUREMENTS Ph.D. Thesis - Technische Hochschule, Darmstadt [ANALYSE VON HOCHPRAEZISEN SCHWEREMESSUNGEN]
Matthias Becker 1984 99 p refs In GERMAN Sponsored by Deutsche Forschungemeinschaft
(Ser-C-294; ISBN-3-7696-9344-2; ISSN-0065-5325) Copyright. Avail: Issuing Activity

The simultaneous measurements of a 14 day campaign with 12 La-Coste Romberg LRC Model D gravimeters were analyzed in order to determine maximum attainable accuracy. The periodic

error amplitudes are determined with an accuracy better than 1 microgal. The gravimeter nonlinearities can be corrected using a calibration polynomial. No systematic changes in the calibration function are found for large measuring ranges. On the calibration line an average adjusted reading error of 2.9 microgal is found. Modelling of the changes in reading is problematic due to the complex, nonlinear reaction of the gravimeter. The residues of the adjustment contain systematic station specific parts -due to rest errors- which can be taken into account with the proposed refined model. The good results and perturbation effects modelling problems indicate additional thermostatization of the gravimeter and optimum elimination of vibrations as the best possibilities to enhance the accuracy. By changing the measuring range it is possible to work always with the same meter reading for each point in repeated measurements. Author (ESA)

N85-10473*# Universities Space Research Association, Boulder, Colo.
RESEARCH STUDY: STUDIES IN ATMOSPHERIC PROCESSES FROM SPACE PLATFORMS Final Report, 10 Apr. 1980 - 31 Dec. 1983
10 Apr. 1980 6 p
(Contract NAS8-33730)
(NASA-CR171176; NAS 1.26:171176) Avail: NTIS HC A02/MF A01 CSCL 04A

Activities of the project for studies in atmospheric processes from space platforms are described. Topics include feasibility studies for a Low Altitude Research Satellite system, a satellite borne Doppler lidar wind monitoring system, the relationship between solar variability and weather, atmospheric modeling, cloud physics, and aerosol studies. M.A.C.

N85-10474*# Brown Univ., Providence, R. I. Dept. of Geological Sciences.
IMPACT PHENOMENA AS FACTORS IN THE EVOLUTION OF THE EARTH
R. A. F. Grieve and E. M. Parmentier [1984] 16 p refs
(Grants NAGw-454; NAG9-77)
(NASA-CR-174015; NAS 1.26:174015) Avail: NTIS HC A02/MF A01 CSCL 08G

It is estimated that 30 to 200 large impact basins could have been formed on the early Earth. These large impacts may have resulted in extensive volcanism and enhanced endogenic geologic activity over large areas. Initial modelling of the thermal and subsidence history of large terrestrial basins indicates that they created geologic and thermal anomalies which lasted for geologically significant times. The role of large-scale impact in the biological evolution of the Earth has been highlighted by the discovery of siderophile anomalies at the Cretaceous-Tertiary boundary and associated with North American microtektites. Although in neither case has an associated crater been identified, the observations are consistent with the deposition of projectile-contaminated high-speed ejecta from major impact events. Consideration of impact processes reveals a number of mechanisms by which large-scale impact may induce extinctions. M.G.

N85-10475*# Engineering Analysis, Inc., Huntsville, Ala.
PROCESSING AND DISPLAY OF ATOMOSPHERIC PHENOMENA DATA Final Report
Frank B. Tatom, Robert A. Garst, and Lynn R. Purser Oct. 1984 21 p refs
(Contract NAS8-33818)
(NASA-CR-171178; NAS 1.26:171178; EAI-TR-84-003A) Avail: NTIS HC A02/MF A01 CSCL 04A

A series of technical efforts dealing with various atmospheric phenomena is described. Refinements to the Potential in an Electrostatic Cloud (PEC) model are discussed. The development of an Apple III graphics program, the NSSL Lightning Data Program and a description of data reduction procedures are examined. Several utility programs are also discussed. M.A.C.

N85-10476# Naval Research Lab., Washington, D. C.
ELECTRON ENERGY LOSS RATES IN N-2, O-2 AND AIR Memorandum Report, 1983 - 1984
A. W. Ali 28 Aug. 1984 34 p
(ARPA Order 4395)
(AD-A145158; AD-E450013; NRL-MR-5400) Avail: NTIS HC A03/MF A01 CSCL 04/1

The rate of energy loss by low energy electrons in N2, O2 and air are calculated for an Electron Maxwellian velocity distribution. For each species the rate coefficients for energy loss to specific inelastic processes are presented. These processes are the vibrational excitation, dissociation, electronic excitations and ionization of the species. Author (GRA)

N85-10477# Texas Univ., Austin. Bureau of Economic Geology.
MICROSEISMIC MONITORING OF CHOCOLATE BAYOU, TEXAS: THE PLEASANT BAYOU NO. 2 GEOPRESSURED/GEOTHERMAL ENERGY TEST WELL PROGRAM
F. J. Mauk, B. Kimball, and R. A. Davis 1984 168 p refs
(Contract DE-AC08-79ET-27111)
(DE84-014825; DOE/ET-27111/11) Avail: NTIS HC A08/MF A01

The Brazoria seismic network, instrumentation, design, and specifications are described. The data analysis procedures are presented. Seismicity is described in relation to the Pleasant Bayou production history. Seismicity originating near the chemical plant east of the geopressured/geothermal well is discussed. DOE

N85-10478# National Geodetic Survey, Rockville, Md.
PREDICTION OF DEFLECTIONS OF THE VERTICAL BY GRAVIMETRIC METHODS
Rudolf J. Fury 1984 34 p refs
(PB84-213727; NOAA-TR-NOS-NGS-28; NOAA-84062602) Avail: NTIS HC A03/MF A01 CSCL 08E

Since an abundance of gravity data has become available for the prediction of vertical deflections and geoid undulations to sufficient accuracy, a gravimetric method was developed for predicting these geodetic parameters. This system employs numerical integration of surface gravity in the vicinity of the station and harmonic coefficients of a geoid derived from satellite tracking data in distant areas. The technique was successfully used for the prediction of vertical deflections and geoid undulation at every occupied station of the U.S. horizontal geodetic network. Systematic errors were removed by fitting the predictions to deflections obtained by astronomic methods. GRA

N85-10479# National Academy of Sciences - National Research Council, Washington, D. C. Committee on Solar-Terrestrial Research.
NATIONAL SOLAR-TERRESTRIAL RESEARCH PROGRAM
May 1984 49 p Sponsored in part by NSF and NOAA
(Grants NSF ATM-81-22148; AF-AFOSR-0028-84)
(PB84-216183) Avail: NTIS HC A03/MF A01 CSCL 04A

A National solar-terrestrial research program is recommended. This program enables us to increase understanding the key physical mechanisms coupling the solar terrestrial system. Solar terrestrial research is the study of the essential processes by which energy in all forms is generated by the Sun, is transported to Earth, and ultimately vitally influences the terrestrial environment. GRA

N85-10480# National Park Service, Atlanta, Ga. Science Publications Office.
GEOLOGY AND GEOMORPHOLOGY OF THE SOUTHERN CENTRAL BLUE RIDGE: AN INDEXED BIBLIOGRAPHY
Steven P. Yurkovich 1984 82 p
(PB84-225119; R/RM/SER-67) Avail: NTIS HC A05/MF A01 CSCL 08G

A bibliography of 875 references on the geology and geomorphology of the southern and central Blue Ridge is presented. Included are published articles, reports, monographs, bulletins, professioinal papers, dating from 1875 to the present. References for inclusion were obtained by searching through pertinent periodicals, monograph series, books, U.S. Geological Survey publications and State Geological Survey publications from

Alabama, Georgia, Maryland, North Carolina, Pennsylvania, South Carolina, Tennessee, Virginia and West Virginia. The bibliography is indexed by author and subject matter. GRA

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N85-10481# Danish Meteorological Inst., Copenhagen.
THE CLIMATE OF DENMARK. SUMMARIES OF OBSERVATIONS FROM LIGHT VESSELS. 3: SEA TEMPERATURE
Agnes Sparre 1984 340 p In ENGLISH and DANISH
(ISBN-87-7478-215-0) Avail: NTIS HC A15/MF A01

Daily sea temperatures were taken in Danish waters from coastal station and by light vessel stations from 1931 to 1970. These measurements are tabulated and presented. B.G.

N85-10482# Council for Scientific and Industrial Research, Stellenbosch (South Africa). Physical Oceanography Div.
LARGE-SCALE OCEAN-ATMOSPHERE INTERACTIONS IN THE MID-LATITUDES AND EQUATORIAL REGIONS: A LITERATURE REVIEW
Jane F. Gillooly Mar. 1983 43 p refs
(CSIR-T/SEA-8302; ISBN-0-7988-2591-X) Copyright. Avail: NTIS HC A03/MF A01

The research carried out on large scale ocean/atmosphere interactions with time scales between one month and one decade is reviewed. The physical relationships and coupling mechanisms of the ocean and the atmosphere in the equatorial and midlatitudes are examined. The impact of this research on long range weather forecasting is also discussed. M.A.C.

N85-10483# World Climate Programme, Geneva (Switzerland).
REPORT OF THE FIRST SESSION OF THE INTERNATIONAL WORKING GROUP ON DATA MANAGEMENT FOR THE INTERNATIONAL SATELLITE CLOUD CLIMATOLOGY PROJECT (ISCCP)
1982 112 p refs Symp. held in New York, 13-17 Dec. 1982
(WCP-42) Avail: NTIS MF A01; print copy available at WMO, Geneva

Topics discussed included the overview of the International Satellite Cloud Climatology Project (ISCCP); satellite calibration functions; sector processing functions; global processing functions; cloud cover sampling capability of various satellite combinations; cloud algorithms intercomparisons; averaging and sampling scheme for data volume reduction; and data tape formats. For individual titles, see N85-10484 through N85-10488.

N85-10484*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CLOUD COVER SAMPLING CAPABILITY OF VARIOUS SATELLITE COMBINATIONS FOR ISCCP
Edwin F. Harrison, Patrick Minnis, and Gary G. Gibson (Kentron Technical Center) *In* World Climate Program Rept. of the First Session of the International Working Group on Data Management for the International Satellite Cloud Climatology Project (ISCCP) 1982 27 p (For primary document see N85-10483 01-47)
Copyright. Avail: NTIS MF A01; print copy available at WMO, Geneva CSCL 04B

One of the most important objectives of the International Satellite Cloud Climatology Project (ISCCP) is the quantification of cloud cover and associated radiation parameters for climate research. The time-varying nature of cloud cover requires a measurement system that obtains cloud radiance at sufficient time intervals for determining accurate values of cloudiness for the appropriate averaging period. Current plans for the ISCCP call for such day to be acquired every 3 hours during both data and night to ensure that the diurnal cycle of cloud cover is adequately sampled. The satellite system proposed is an array of geostationary and polar-orbiting satellites. The error in mean cloud cover estimates for observation systems which do not include geostationary satellites are quantified. Candidates for such a system include two NOAA Sun-synchronous satellites with daylight equatorial-crossing times of 0730 and 1430, and a USSR satellite in an 81 deg. inclination, 900-km altitude orbit. B.G.

N85-10485# World Climate Programme, Geneva (Switzerland).
ISCCP CLOUD ALGORITHM INTERCOMPARISON WORKSHOP
In its Rept. of the First Session of the International Working Group on Data Management for the International Satellite Cloud Climatology Project (ISCCP) 1982 20 p Workshop held in New York, 9-11 Dec. 1982 (For primary document see N85-10483 01-47)
Copyright. Avail: NTIS MF A01; print copy available at WMO, Geneva

The International Satellite Cloud Climatology Project (ISCCP) is designed to provide a global climatology of radiances and derived cloud optical properties to characterize the distribution and variation of clouds and their effects on Earth's radiation budget. The congruence between improved ability to retrieve atmospheric, surface and cloud optical properties from satellite-observed radiances and improved ability to incorporate realistic optical properties in climate models focuses on determination of cloud radiative properties. Currently available cloud analysis agorithms was initiated in late 1981 were compared. The same satellite radiance (visible and infrared) data set, covering 15 days in February 1979 for three geographic regions, was sent to about ten research groups. A program of comparison analyses, including the effects of data volume compression, was defined. Preliminary comparisons of results and improved task definitions were completed. More detailed comparison of results and selection of the operational algorithms were conducted. B.G.

N85-10486# World Climate Programme, Geneva (Switzerland).
ISSCP CLOUD ALGORITHM INTERCOMPARISON WORKSHOP
In its Rept. of the First Session of the International Working Group on Data Management for the International Satellite Cloud Climatology Project (ISCCP) 1982 27 p ref Workshop held in Ottawa, 31 May - 1 Jun. 1982 (For primary document see N85-10483 01-47)
Copyright. Avail: NTIS MF A01; print copy available at WMO, Geneva

Discussion focused on two broad topics: (1) effects of data sampling and averaging on deduced cloud properties, and (2) statistical relationships in the data that might be diagnostic of cloud types. Preliminary evaluation of data sampling and averaging showed no large changes in retrieved cloud properties caused by averaging to 8 km resolution, or by sampling to 32 km for most schemes, except when clouds are scarce in the region examined. The latter seems to be caused by under-sampling as would be expected. New cloud analysis schemes were discussed. The focus was on two key problems: properly identifying cirrus cloud and determining the presence of high thin clouds. B.G.

N85-10487# European Space Agency, Paris (France).
NOWCASTING 2. MESOSCALE OBSERVATIONS AND VERY-SHORT-RANGE WEATHER FORECASTING
Bruce Battrick, ed. and Erica Rolfe, ed. Jun. 1984 535 p refs Proc. of 2nd intern. Symp. on Nowcasting, Norrkoeping, Sweden, 3-7 Sep. 1984; sponsored by International Association of Meteorology and Atmospheric Physics, WMO, ESA and Swedish Meteorological and Hydrological Institute Original contains color illustrations
(ESA-SP-208; ISSN-0379-6566) Avail: NTIS HC A23/MF A01; ESA, Paris DFL 65 Member States, AU, CN and NO (+ 20% others)

The nature of mesoscale phenomena; analysis and interpretation of satellite-based and ground-based observations of mesoscale phenomena; pattern advection and extrapolation methods in very short range forecasting; numerical-dynamical models; boundary layer models; meteorological nowcasting services; user requirements; and information dissemination were discussed. For individual titles, see N85-10488 through N85-10568.

N85-10488# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.

THE MESOSCALE-BETA-SCALE EVOLUTION OF MID-LATITUDE MESO-ALPHA-SCALE CONVECTIVE COMPLEXES
W. R. Cotton and R. L. McCanelly *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 3-8 refs (For primary document see N85-10487 01-47)
(Grants NSF ATM-83-12077; NSF ATM-83-06521; AF-AFOSR-0162-82)
Avail: NTIS HC A23/MF A01

Meso-beta-scale temporal and spatial characteristics associated with the meso-alpha-scale convective complex (MCC) were synthesized into a conceptual life-cycle model for the improved short-range forecasting of MCCs. Included in this model is a characteristic MCC precipitation signature in relation to its satellite appearance. Each MCC is typically preceded by multiple meso-beta convective clusters aligned along linear meso-alpha features evident in hourly surface or satellite data. Intense MCC growth centers on meso-beta clusters located nearest the intersection of the meso-alpha features along which they are aligned. Throughout the mature phase of the MCC, multiple meso-beta convective components persist within expanding anvil precipitation regions, and the decay of the system is marked by the weakening and diffluent propagation of its meso-beta convective components.
Author (ESA)

N85-10489# Air Force Geophysics Lab., Hanscom AFB, Mass.
ON THE NOWCASTING OF MOUNTAIN-GENERATED THUNDERSTORM SYSTEMS
Robert M. Banta and Crystal L. Barker *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting June. 1984 p 9-13 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

Geosynchronous satellite data were used to locate initiation points for thunderstorms which form in the vicinity of mountains. Results show that storms form in the mountains, as opposed to the nearby low areas (plains or wide basins). In one linear mountain range thunderstorms tend to form to the lee of the range, but in more complex (i.e., less linear) mountain regions the mechanisms by which storms formed are harder to determine. In nearly 170 storms, several clusters of initiation points, representing genesis regions, are found.
Author (ESA)

N85-10490# National Center for Atmospheric Research, Boulder, Colo. Convective Storms Div.
GENERATION OF DEEP CONVECTIVE CLOUDS ALONG MESOSCALE STORM OUTFLOW BOUNDARIES
Edward J. Szoke, Edward J. Zipser, and Charles G. Wade *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 15-20 refs Sponsored by NSF (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

Mesoscale outflows from convective storms are analyzed for several days from data from experiments in eastern Montana and northeast Colorado. In many cases the outflow boundaries become the focus of new convection, and therefore monitoring these boundaries can aid in a short-range forecast of convective storms. Two cases are shown in detail, emphasizing that one forecast problem is distinguishing those areas where the outflow boundary initiates new storms from those where it does not. It is shown that the outflow depth may be one of a number of important parameters in explaining these differences, and that the problem may not have a simple solution.
Author (ESA)

N85-10491# National Center for Atmospheric Research, Boulder, Colo.
THE MICROBURST AS A HAZARD TO AVIATION: STRUCTURE, MECHANISMS, AND NOWCASTING
John McCarthy and James W. Wilson *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 21-30 refs Sponsored by NSF (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

The convective microburst is shown to be a serious worldwide aviation hazard. Multiple Doppler and surface mesonet analyses from the Joint Airport Weather Studies Project show the microburst as a concentrated down- and outflow having an average horizontal dimension of 3 km and a headwind/tailwind shear averaging 25 m/sec with a mean lifetime of 10 min. Microbursts can be imbedded in thunderstorm precipitation or in benign-appearing virga. Five mechanisms govern microburst formation: subcloud cooling from evaporating precipitation, cooling from melting, frictional drag from falling precipitation, dynamically induced vertical pressure gradients, and downward transport of horizontal momentum. Aviation safety improvements and nowcasting techniques using meteorological precursors derived from proximity sounding studies and from Doppler radar are discussed.
Author (ESA)

N85-10492# Bureau of Reclamation, Denver, Colo.
AUTOMATED ANALYSIS AND NOWCASTING OF MESOSCALE CONVECTIVE SYSTEMS
David A. Matthews *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 31-36 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

A set of meso-beta scale sounding, radar, rain gage observations and a fast, economical automated objective analysis system for kinematic and thermodynamic variables are presented. Data was collected in the 1979 Texas High Plains Cooperative Program. The analyses of rawinsondes indicate that vertical motion and moisture flux patterns control the regions of convective development. Simple Lagrangian parcel model calculations using initial conditions modified by the analyzed lifting profile result in prediction of cloud growth comparable to that observed. Meso-beta scale spatial variations of the predicted cloud top heights match the echo top heights reasonably well.
Author (ESA)

N85-10493# Zentralanstalt fuer Meteorologie und Geodynamik, Vienna (Austria).
THREE-DIMENSIONAL MESOSCALE ANALYSIS OF SERIAL SOUNDINGS
G. Ragette *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 37-40 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

A procedure for analyzing serial radiosonde ascents is presented. Time-to-space conversion is applied to combine different soundings and an interpolation scheme is used to analyze automatically the 3-dimensional fields of temperature, humidity, wind and time. From the grid point data the vertical velocity, the 3-dimensional air flow and the rate of precipitation are derived. Results for a day on which frontal thunderstorms occurred are presented. Mesoscale patterns are described with respect to the synoptic scale situation and the computed precipitation pattern is compared with radar data. Good agreement between these two fields is found, the mesoscale vertical motions explaining most of the observed precipitation.
Author (ESA)

N85-10494*# Wisconsin Univ., Madison. Space Science and Engineering Center.
THE INDUCEMENT OF PLANETARY BOUNDARY LAYER MASS CONVERGENCE ASSOCIATED WITH VARYING VORTICITY BENEATH TROPOSPHERIC WIND MAXIMUM
Donald R. Johnson *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 41-46 refs (For primary document see N85-10487 01-47)
(Contract NAS8-33222; Grant NSF ATM-81-10678)
Avail: NTIS HC A23/MF A01 CSCL 04B

The effects of the vorticity distribution are applied to study planetary boundary layer mass convergence beneath free tropospheric wind maximum. For given forcing by viscous and pressure gradient forces beneath a wind maximum, boundary layer cross stream mass transport is increased by anticyclonic vorticity on the right flank and decreased by cyclonic vorticity on the left flank. Such frictionally forced mass transport induces boundary layer

mass convergence beneath the relative wind maximum. This result is related to the empirical rule that the most intense convection and severe weather frequently develop beneath the 500 mb zero relative vorticity isopleth. Author (ESA)

N85-10495# National Oceanic and Atmospheric Administration, Boulder, Colo.

FORECASTING OF POLAR LOWS

L. S. Fedor, A. Foss (Norwegian Meteorological Inst., Oslo), S. Groenaas (Norwegian Meteorological Inst., Oslo), V. Hoem (Norwegian Meteorological Inst., Oslo), M. Lystad (Norwegian Meteorological Inst., Oslo), M. A. Shapiro, and K. Wilhelmsen (Norwegian Meteorological Inst., Oslo) *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 47-52 refs (For primary document see N85-10487 01-47)

Avail: NTIS HC A23/MF A01

Extrapolation techniques and numerical simulations were used to forecast shallow mesoscale depressions which develop rapidly during cold air out-breaks in high latitude regions. The horizontal scale of these lows observed in the Norwegian Sea is of the order of a few hundred kilometers and they have a vertical depth of 1 to 5 km. Strong wind and heavy snow fall are observed, and since they may develop during a few hours, they represent a danger to oil drilling operations. The main part of the development is simulated correctly; baroclinic effects formed by synoptic scale advection are the most important factor in the intensification of the low. Near the low pressure center organized convection takes place, which may cause an additional deepening, not well represented by the model. Author (ESA)

N85-10496# Purdue Univ., Lafayette, Ind. Dept. of Geosciences.

RAIN BANDS AND SYMMETRIC INSTABILITY

Wen-yih Sun *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 53-56 refs (For primary document see N85-10487 01-47)

Avail: NTIS HC A23/MF A01

A linearized two-dimensional model was used to study formation and evolution of rainbands which produce intense precipitation over eastern Asia during spring and summer, and squall lines over the eastern part of the United States in April. Condensation is included in this nonhydrostatic model. The horizontal temperature gradient is introduced to maintain a vertical wind shear. Results show that rain bands propagate toward the warm side. The small, weak bands are killed by subsidence warming associated with the descending branches of their stronger neighbors, so they merge into large rainbands with a horizontal wavelength of a few hundred kilometers in the mature stage. It is found that subsidence warming is very important compared with condensation heating inside the cloud, especially for selection of the preferred mode. Author (ESA)

N85-10497# Hydrometeorological Centre of the USSR (Moscow).

LAYERED SLOPING MESOSCALE STRUCTURES AND RAINBANDS IN ATMOSPHERIC FRONTAL REGIONS AND THEIR RELATION TO SYMMETRIC INSTABILITY

Natalie P. Shakina, Alexander A. Postnov (Central Aerological Observatory, Dolgoprudny, USSR), and Alexey A. Lyakhov *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 57-62 refs (For primary document see N85-10487 01-47)

Avail: NTIS HC A23/MF A01

Mesoscale layered structures in temperature and wind fields in frontal regions were revealed by aircraft measurements. In a cross-section plane, the layers are parallel to the main baroclinic zone. The parameters of the layered structures agree qualitatively and quantitatively with those of symmetric unstable waves in the saturated air. Rain intensity temporal spectra calculated for periods ranging from minutes to hours for warm and cold fronts follow power functions with exponents -2 and -5/3. Author (ESA)

N85-10498# Deutscher Wetterdienst, Offenbach am Main (West Germany).

ABOUT THE INFLUENCE OF NONADIABATIC PROCESSES ON FRONTOGENESIS NEAR THE GROUND

M. Kurz *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 63-67 refs (For primary document see N85-10487 01-47)

Avail: NTIS HC A23/MF A01

The importance of nonadiabatic effects for frontogenesis in the lower troposphere is demonstrated by an example of a summer weather situation. A narrow zone of increasing temperature gradient develops below the edge of an extensive cloud band due to large horizontal differences of heating from the ground. The frontogenetic effect is strengthened by cooling through evaporation of falling rain in the cloud area. Combined with the frontogenesis a direct solenoidal circulation begins, which finally causes a release of potential instability and convective overturnings. Thus the new frontal zone partly transforms into a squall-line. Author (ESA)

N85-10499# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.

SOME MESOSCALE WEATHER EFFECTS AND THE VERY SHORT-RANGE FORECASTING IMPACT OF VARIABLE SNOW COVER

R. H. Johnson, G. S. Young, J. J. Toth, and R. M. Zehr *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 69-74 refs (For primary document see N85-10487 01-47)

(Grants NA81RA-H-00001; NA84AA-H-00017)

Avail: NTIS HC A23/MF A01

Data from the Program for Regional Observing and Forecasting Services surface mesonetwork were used to document the effect of variable snow cover on atmospheric boundary layer properties, cloudiness and weather conditions over northeast Colorado. Analysis suggests that snow boundaries on the day studied acted through the development of a weak solenoidal field to enhance low-level inflow into a snow-free area within this region, therby assisting with cloud development over the snow-free ground. Analogous to the sea breeze, this phenomenon might be termed a snow breeze. Very-short-range forecasting of weather associated with phenomena such as this can be greatly improved with data from surface mesonetworks. Author (ESA)

N85-10500# Institute of Meteorology and Hydrology, Bucharest (Rumania).

BLACK SEA COASTAL FRONTOGENESIS

Ion Draghici *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 75-79 refs (For primary document see N85-10487 01-47)

Avail: NTIS HC A23/MF A01

A coastal frontogenesis phenomenon is identified along the western and northern shore of the Black Sea. The typical thermal gradients across the coast are of the order of 6 to 8 C over distances < 50 km. For the western-northwestern shore, wind direction changes from easterly over the sea to northerly over the land. This convergence line along the coast has a typical time scale of the order of 12 to 18 hr. A case study is given. Author (ESA)

N85-10501# Colorado Univ., Boulder. Cooperative Inst. for Research in Environmental Science.

DETAILED ANALYSIS OF THE STRUCTURE OF LOCAL WIND SYSTEMS IN CANTERBURY, NEW ZEALAND

A. P. Sturman and I. G. McKendry (Canterbury Univ., New Zealand) *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 81-85 refs (For primary document see N85-10487 01-47)

Avail: NTIS HC A23/MF A01

A research program which studies the spatially and temporally complex local wind regime of the Canterbury region (New Zealand) is summarized. Results of observational studies illustrate interaction of airflow components of differing scales. The interaction of orographic and thermotopographic effects with gradient flow produces both classic and locally unique features. The strength

of the alpine mountain and valley wind systems is seen to be dependent on the degree of sheltering from gradient airflow. Land and sea breeze systems on the Canterbury Plains show great spatial and temporal variability due to interaction with other regional and synoptic airflow patterns. Author (ESA)

N85-10502# Eidgenoessische Technische Hochschule, Zurich (Switzerland). Inst. of Atmospheric Physics.
FRONTAL MOTION IN MOUNTAINOUS TERRAIN: ANALYSIS AND IMPLICATIONS FOR 0 TO 12 HOUR FORECASTS
H. C. Davies and P. D. Phillips *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 87-92 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

The signature, retardation and distortion of the surface features of cold fronts on the Alpine north-side were studied, using automatic recording stations. Case study analyses provides detailed time-height sections of pressure, static energy, moist static energy and precipitation for the Gotthard crossection of the Alps, and isochrone plots of the surface frontal location for the whole of Switzerland. Implications for the analysis and forecasting of the orographic modification of the rate of frontal progression are discussed.
Author (ESA)

N85-10503*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE PAST, PRESENT, AND ANTICIPATED FUTURE CONTRIBUTIONS OF GEOSYNCHRONOUS SATELLITES TO SHORT RANGE PREDICTION
William E. Shenk and Henry L. Schmidt *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting June. 1984 p 95-98 Prepared in cooperation with NOAA, Boulder, Colo. (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01 CSCL 04B

Use of geosynchronous satellites to improve the short range prediction of convective and mesoscale phenomena by measuring cloud parameters; surface temperature; and temperature and moisture profiles and gradients (in clear and partly cloudy areas) with temporal resolutions of minutes, and spatial scales ranging from 1 km (for clouds) to tens to kilometers (temperature and moisture profiles) is discussed. Improvements can be made with microwave sounding (temperature and moisture profiles in cloudy areas) and imaging (precipitation). Higher spectral resolution infrared sounding yields a 50% better vertical resolution for temperature and moisture profiles. Very high resolution imaging (infrared resolution of 1 km, visible resolution of 200 m) is advocated for convection monitoring. Author (ESA)

N85-10504*# National Oceanic and Atmospheric Administration, Boulder, Colo. Development Lab.
USE OF SATELLITE SOUNDINGS AND IMAGERY FOR NOWCASTING AND VERY-SHORT-RANGE FORECASTING
James F. W. Purdom *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 99-111 refs Original contains color illustrations (For primary document see N85-10487 01-47)
(Grants NAGw-504; NA84AA-H-00017)
Avail: NTIS HC A23/MF A01 CSCL 04A

Examples of GOES-East satellite imagery and sounding channel information are used to show how atmospheric behavior in the vicinity of intense mesoscale weather events can be analyzed. Mesoscale spatial and temporal information on atmospheric thermal structure and moisture distribution can be determined using satellite sounding and multispectral image data. Clouds and cloud patterns in a satellite image or animated series of images represent the integrated effect of ongoing dynamic and thermodynamic processes in the atmosphere. When information from satellite data is combined with radar, surface and upper air observations, important processes in storm development can be better understood. Author (ESA)

N85-10505# National Oceanic and Atmospheric Administration, Washington, D. C. Satellite Applications Lab.
NESDIS OPERATIONAL PRECIPITATION ESTIMATION TECHNIQUES
Roderick A. Scofield *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 115-122 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

Three GOES-satellite based methodologies for analyzing and forecasting (short range) precipitation from convective systems, extratropical cyclones and tropical cyclones are described. Satellite-derived precipitation estimates and 3-hr precipitation trends for these phenomena are computed on the NESDIS Interactive Flash Flood Analyzer and transmitted to Weather Service Forecast Offices, Weather Service Offices and River Forecast Centers. These estimates and trends aid hydrologists and meteorologists in their evaluation of heavy precipitation events. Author (ESA)

N85-10506# Naval Postgraduate School, Monterey, Calif. Dept. of Meteorology.
GEOSTATIONARY SATELLITE CLOUD AND PRECIPITATION ANALYSIS USING AN INTERACTIVE COMPUTER SYSTEM
C. Wash, L. Chou, and L. Spray *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 123-127 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

A satellite-derived cloud and precipitation analysis program was developed for an interactive minicomputer system. The program uses geostationary infrared and visual data with operational upper air, surface and sea surface temperature analyses from the Fleet Numerical Oceanographic Center to specify cloud type, cloud amount, cloud top height and temperature and estimated precipitation areas. The analysis uses a bispectral method for cloud amount and cloud top height and threshold tests on normalized visual (albedo), infrared area estimation. The program was verified using GOES-East data (2 nm visual and 2 x 4 nm IR) for a 1600 x 1600 nm area over the Eastern United States and West Atlantic Ocean. Author (ESA)

N85-10507# McGill Radar Weather Observatory, Ste. Anne de Bellevue (Quebec).
A SCHEME FOR THE DELINEATION AND EXTRAPOLATION OF THUNDERSTORMS FROM GOES SATELLITE DATA
G. L. Austin and A. Bellon *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 129-137 refs Sponsored by Canadian Natural Sciences and Engineering Research Council, Canadian Atmospheric Environment Service, and AFGL (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

An empirical relationship between radar reflectivity levels exceeding 35 dBZ at a height of 6 km and sferics data is used to generate maps that indicate regions of thunderstorms. These radar maps serve as ground truth when compared with colocated GOES visible infrared imagery. A threshold, computed so as to equalize the radar and satellite thunderstorm areas, delineates the region in VIS-IR space most probably associated with electrical activity. The locations of satellite delineated storms beyond radar range, on the synoptic scale, show good agreement with lightning positions from spherics detectors. The skill of schemes involving the extrapolation of these areas for short range forecasting is discussed. Author (ESA)

N85-10508# Atmospheric Environment Service, Downsview (Ontario).
TEST RESULTS FROM RAINSAT
P. King *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 139-144 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

The RAINSAT system for the analysis and short-range forecasting of rain areas is described. Tests results from summertime cases for a variety of synoptic conditions are compared using real time

and average classifications. The effect on scores of reducing the data resolution is noted. Rain areas are classified correctly in regions remote from the classifying radar. Systematic errors occur, but can be corrected. Accuracy is related to the sharpness and location of the peak of raining points in a visible/IR histogram. Good results are achieved for widespread stratiform rain except in one case. The forecast algorithm does not perform well.
Author (ESA)

N85-10509# Hydrometeorological Inst. (Czechoslovakia).
COMBINING RADAR AND SATELLITE DATA FOR THE LOCALIZATION AND IDENTIFICATION OF SUMMER CONVECTION
J. Strachota *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 147-151 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

Radar and satellite observations of dangerous convective phenomena are analyzed separately and combined manually with conventional meteorological data. The success of the radar identification of storms and showers over the Bohemian territory within the range of 150 km is determined by comparing it with data obtained by synoptic stations during summer. Use of combined radar and satellite measurements of the cloud top height is discussed. The radar method is compared with the determination of the temperature height of the cloud top by calibrated infrared data from TIROS-N/NOAA satellites. Best results are obtained for cellular convective cloudiness. Author (ESA)

N85-10510# Central Inst. for Weather Forecasting, Budapest (Hungary).
A MULTIPURPOSE WEATHER RADAR NETWORK
A. Kapovits *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 153-157 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

The Hungarian weather radar network is described. The network, based on MRL-5 weather radars, consists of three stations covering the whole Carpathian basin. Algorithms for routine observations were developed. Raw data, converted into known parameters are manually digitized and transmitted in mapped form by teletype. The data received in this way, together with data from other sources, can be processed either manually or automatically. The output data are used for weather analysis, storm warning, hydrological and aviation safety purposes. Author (ESA)

N85-10511*# National Aeronautics and Space Administration, Washington, D. C.
REMOTE SENSING OF ATMOSPHERIC PARTICULATES: TECHNOLOGICAL INNOVATION AND PHYSICAL LIMITATIONS IN APPLICATIONS TO SHORT-RANGE WEATHER PREDICTION
R. J. Curran, R. Kropfli (NOAA, Boulder, Colo.), and J. Hallett (Desert Research Inst.) *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 159-164 refs (For primary document see N85-10487 01-47)
(Grants NSF ATM-82-09684; NSF ATM-82-18349) Avail: NTIS HC A23/MF A01 CSCL 04B

Techniques for remote sensing of particles, from cloud droplet to hailstone size, using optical and microwave frequencies are reviewed. The inherent variability of atmospheric particulates is examined to delineate conditions when the signal can give information to be effectively utilized in a forecasting context. The physical limitations resulting from the phase, size, orientation and concentration variability of the particulates are assessed.
Author (ESA)

N85-10512# Manchester Univ. (England). Dept. of Physics.
THE USE OF DUAL POLARISATION RADAR FOR OBSERVING AND PREDICTING CONVECTIVE ACTIVITY
A. J. Illingworth, J. W. F. Goddard (Science Research Council, Chilton, England), and S. M. Cherry (Science Research Council, Chilton, England) *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 165-170 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

Measurements of total backscattered radiation detected (Z) and diameter and rainfall rate (ZDR) are used to calculate rainfall rates which are compared with estimates from Z alone to show circumstances where large errors in rainfall rate using the single parameter measurement may be expected. In addition, ZDR gives information on the phase of the hydrometeors that can be used to detect hail reaching the ground in convective storms. The ZDR characteristics which help to identify rapidly developing convective clouds are presented. Author (ESA)

N85-10513# Swedish Meteorological and Hydrological Inst., Norkoeping.
THE PROMIS DOPPLER RADAR SYSTEM; DESIGN AND OPERATIONAL EXPERIENCE
Tage Andersson, Sverker Magnusson, Bengt Lindstroem, and K.-G. Karlsson *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 171-176 refs Original contains color illustrations (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

A weather radar system consisting of a linear receiver, preprocessor, radar data processor, display system and a conventional C-band weather radar (EEC, WSR-81) is described. The radar makes three dimensional scans and has Doppler capability. For rain intensity the operator selects one of four reflectivity factor rain intensity relations. The unambigous velocity interval is + or - 48 m/sec. Ground echoes are efficiently suppressed. A high performance 32 bit minicomputer gives rapid display of several types of pictures. Author (ESA)

N85-10514# National Center for Atmospheric Research, Boulder, Colo.
NOWCASTING WITH DOPPLER RADAR: THE FORECASTER-COMPUTER RELATIONSHIP
James W. Wilson and Richard Carbone *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting June. 1984 p 177-186 refs Sponsored by NSF (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

Doppler radar applications for clear air, widespread precipitation and convective storms are tabulated, and a subjective characterization of the forecaster computer relationship for each application is given. The forecaster subjectively applies basic physical principles and pattern recognition techniques. The computer objectively detects and extrapolates events and quantifies their extent and magnitude. Doppler applications to forecasting convective storm initiation and precipitation rate changes for widespread precipitation are illustrated. Author (ESA)

N85-10515# National Oceanic and Atmospheric Administration, Norman, Okla.
DOPPLER RADAR ANALYSIS OF A FRONTAL ZONE PRIOR TO CONVECTIVE DEVELOPMENT
R. Rabin, A. J. Koscielny, and D. E. Ziegler (Systems and Applied Science Corp., Vienna, Va.) *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 187-191 refs Sponsored in part by NEXRAD (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

The use of Doppler radars capable of monitoring the wind structure in the lower atmosphere continuously prior to cloud development in short term forecasting is illustrated. The radar derived winds are used to supplement conventional data and provide three dimensional mapping of an elevated front. The altitude of the front and airmass stability determine the locations of thunderstorm initiation. Storm motion is closely related to the orientation of the front. Winds deduced from Doppler radial velocities are compared with available rawinsonde data to check the validity of the applied techniques. Despite inherent limitations, Doppler radar data is useful for nowcasting observations.
Author (ESA)

N85-10516# National Oceanic and Atmospheric Administration, Boulder, Colo. Aeronomy Lab.
VHF/UHF RADAR AND ITS APPLICATION IN NOWCASTING
K. S. Gage and T. W. Schlatter *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 193-200 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

A network of UHF and VHF radars in Colorado was used to study spatial and temporal variations of tropospheric and lower stratospheric winds. The connection between mesoscale variations in upper level winds as seen by the radar network and surface weather was examined. A storm where the expected snow did not fall, and storms with moderate to heavy snow illustrate the contribution of the wind profilers to short term forecasting.
Author (ESA)

N85-10517# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Electron Physics.
USE OF GROUND BASED MICROWAVE RADIOMETERS FOR NOWCASTING
J. Askne *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 201-207 refs Sponsored by Swedish Board for Space Activities and Swedish Space Co. (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

A temperature profiling radiometer was built. Test results indicate that observations at 11 frequencies yield a better result than observations at only 4. It is not meaningful to try to achieve much better absolute accuracy than the present system, i.e., 0.5 K. It is very important to observe the same air mass with the water vapor and temperature profiling radiometers. Good a priori data can be crucial in obtaining accuracy for meteorological applications.
Author (ESA)

N85-10518# Miami Univ., Fla. School of Marine and Atmospheric Science.
THE POTENTIAL USE OF ATMOSPHERIC PROFILERS IN SHORT-RANGE PREDICTION
Renate Brummer, Rainer Bleck, and Melvyn A. Shapiro (NOAA, Boulder, Colo.) *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 209-212 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

The feasibility of initializing numerical weather prediction models with profiler network data is investigated. The observing system, a combined microwave radiometer and VHF Doppler radar, provides a smoothed out temperature profile and highly accurate wind measurements. A variational analysis technique is applied to infer the missing frontal-scale thermal structures in the three dimensional temperature field from the more accurate wind field observations. Model runs initialized with simulated radiometer derived data and with the upgraded mass field are compared to a control forecast.
Author (ESA)

N85-10519# Swedish Air Force, Stockholm.
A LIGHTNING DETECTION SYSTEM IN SWEDEN
Ulf Christensen and Lars-Goeran Nilsson (Swedish Meteorological and Hydrological Inst.) *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 213-218 refs Original contains color illustrations (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

A lightning detection system used with satellite pictures, radar photos and weather charts to study the relationships between lightning and weather parameters is described. Lightning sensitive activities, such as electric power supply, are reviewed. Studies of a cold front/squall line system and a heat thunderstorm are outlined.
Author (ESA)

N85-10520# Dalhousie Univ., Halifax (Nova Scotia).
ANALYSIS STRATEGIES FOR FIELD DEPENDENT ESTIMATION AND NETWORK DESIGN
H. J. Thiebaux and P. R. Julian (National Center for Atmospheric Research, Boulder, Colo.) *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 219-222 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

Adaptive, stochastic, ensemble meteorological structural models whose parametric formulations are conditional on field state are discussed. The models guide field dependent estimation algorithms and diagnostic tools for establishing requirements for observing arrays. Beginning with the defining characteristics of optimal estimation, the suboptimality of classical analysis schemes and mechanisms for recovering field definition lost through the smoothing of standard interpolation procedures are considered. Potential impact of field dependent estimation, on analysis accuracy, is argued from evidence of significant dependence of covariance structure on the classification of field state, with sea level pressure as an example. Analysis experiments which quantify impact, in relation to classical analysis techniques, are outlined.
Author (ESA)

N85-10521# Atmospheric Environment Service, Toronto (Ontario).
APPLICATION OF AUTOMATIC PATTERN METHODS IN VERY-SHORT-RANGE FORECASTING
Stephen Clodman *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 225-233 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

Pattern correlation, applied to mean sea level (MSL) pressure or visibility is described. Correlation matching finds the best translation vectors expressing the field movement. The translation applied to a current analysis gives an extrapolated, guided or updated forecast. The MSL pressure forecasts work well. Shape fitting of 50 kPa height or MSL pressure is also described. A strong low is fitted by a mathematical function which accurately describes the low, thus leading to an analysis or forecast. The choice of fields and forecast assumptions, and various types of error are considered.
Author (ESA)

N85-10522# Air Force Geophysics Lab., Hanscom AFB, Mass. Atmospheric Prediction Branch.
THE DEVELOPMENT OF OBJECTIVE FORECAST TECHNIQUES BASED ON ADVECTION OF SURFACE WEATHER PARAMETERS
H. Stuart Muench *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 235-239 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

Short-range forecast techniques for local aviation weather conditions were developed. The techniques use upper flows to advect surface weather fields. When initial tests produced forecasts worse than persistance, spectral analyses were performed on time series data to determine frequencies important to short-range forecasting. The advection model was modified on the basis of the spectral analyses, and test scores indicate at best small improvements over persistence. Further improvements are underway but the long-term solution requires nested-grid mesoscale models rather than a simple advection model.
Author (ESA)

N85-10523# Direction de la Meteorologie Nationale, Magny les Hameaux (France).
PRELIMINARY ASSESSMENT OF VERY SHORT TERM FORECASTING OF RAIN FROM SINGLE RADAR DATA
Monique Ciccione and Vincent Pircher *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 241-246 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

Experiments using PPI data, recorded from a single S band radar were conducted to test a correlation technique on the whole image and an echo centroid tracking. The quality of the methods was evaluated utilizing the Critical Success Index and an index introduced by Rousseau (1980), and by comparing with

a persistance hypothesis. The echo tracking technique is very dependent on radar image defects and on the sizes of precipitation areas. The correlation method is more efficient, although the program does not take into account the differential motions of echoes. The computing times can be greatly reduced by using Boolean correlation, without reducing the quality of the results.
Author (ESA)

N85-10524# Institute of Meteorology and Water Management, Warsaw (Poland).
OPTIMUM PARAMETERS FOR DETERMINING THE MOTION OF RADAR FIELD BY CROSS-CORRELATION METHOD
S. Moszkowicz *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 247-248 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

Two meteorological situations are analyzed to find the optimization index (OI) for different parameters. The OI is defined as a ratio of space variability and time variability. The space variability is the rms of the radar parameter field. The time variability is rms distance of fields measured at different times and fitted according to the motion determined by cross correlation. The OI is found for different times on condition that the correlation coefficient between the fields is statistically significant. Author (ESA)

N85-10525# Royal Observatory, (Hong Kong).
DIGITAL RADAR DATA AS AN AID IN NOWCASTING IN HONG KONG
C. Y. Lam IN ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 249-253 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

The 10-cm weather radar system in Hong Kong is described. It generates digital CAPPI displays and provides objective rainfall forecasts based on the 3 km CAPPI through the use of the cross correlation algorithm. Examples of CAPPI displays in tropical cyclones and the monsoon trough are presented to illustrate the characteristics of these rain-bearing systems and effects on the application of the algorithm. Data show that the correlation between observed and forecast rainfall decreases rapidly as the lead time is increased to 1 to 2 hr. Radar also tends to understimate rainfall received at ground level. This is attributed to vertical variation in rainfall intensity. Author (ESA)

N85-10526# Reading Univ. (England). Dept. of Meteorology.
SHORT PERIOD FORECASTS IN WEST AFRICA USING METEOSAT DATA
J. R. Milford and G. Dugdale *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 255-259 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

It is shown that digital infrared geostationary satellite data can be used to identify and monitor the development of propagating West African squall lines. Combining these observing techniques with climatological and traditional forecasting methods improves forecasting of the incidence of the squall lines up to 12 hr ahead. The rapidly varying rainfall rate associated with squall lines severely limits the accuracy of forecasts of local rainfall but wind gust forecasts, area rainfall forecasts useful to agriculture and flood warning services may be more reliable. The statistics of rainfall distribution from squall lines, and the inference of mesoscale processes within the squall line from satellite-derived data are discussed. Author (ESA)

N85-10527*# Colorado State Univ., Fort Collins. Dept. of Atmospheric Sciences.
EVALUATION OF SURFACE SENSIBLE HEAT FLUX EFFECTS ON THE GENERATION AND MODIFICATION OF MESOSCALE CIRCULATIONS
M. Segal, R. A. Pielke, and Y. Mahrer *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 263-269 refs (For primary document see N85-10487 01-47)
(Grants NAG5-359; NSF ATM-83-04042; NA81RA-H-00001)
Avail: NTIS HC A23/MF A01 CSCL 04A

Mesoscale thermal-induced circulations generated by horizontal gradients in surface characteristics as well as significant perturbations on land and sea breezes and mountain-valley winds due to substantial modifications in the thermal forcing are introduced. It is suggested that these types of mesoscale situations are generally ignored in forecasting but that they may have important implications in very short range predictions.
Author (ESA)

N85-10528# Princeton Univ., N. J. Geophysical Fluid Dynamics Lab.
PREDICABILITY OF MESOSCALE PHENOMENA
Isidoro Orlanski and Larry Polinsky *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 271-280 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

Simulations with a high resolution three-dimensional primitive equation model were carried out to assess the impact of initial and boundary data inaccuracies for the simulation of mesoconvective systems and environments. Simulations of Pacific comma clouds, frontal squall lines, mesoconvective complexes and coastal cyclogenesis were studied. The sensitivity of these simulations to surface boundary layer variables and the cloud fraction (latent heat parameterization) was investigated. It is found that in most mesoconvective systems the environmental convergence of a preexisting front is responsible for the growth of storm vorticity, whereas, moisture is essential for its explosive evolution.
Author (ESA)

N85-10529# Pennsylvania State Univ., University Park. Dept. of Meteorology.
THE INITIALIZATION OF MESOSCALE MODELS
Thomas T. Warner *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 281-288 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

Factors that control prediction error growth in limited-area models of the mesoscale atmosphere are discussed: local forcing, the local nonlinear transfer of error from larger scales, and the advection into the domain interior of error from the lateral boundaries of the limited-area model. Three dimensional numerical simulations are used. Results show that lower boundary forcing compensates for a lack of mesoscale structure in the model initial conditions. Lateral boundary condition error increasingly dominates as a limit to forecast accuracy compared to initial condition-error, as smaller scales are reached. Velocity component errors on the mesoscale maintain their original magnitude during the adjustment process. Mass field-related errors on the mesoscale are rapidly transferred to gravity-inertia wave modes.
Author (ESA)

N85-10530# Japan Meteorological Agency, Tokyo. Electronic Computation Center.
A SIMULATION EXPERIMENT OF A RAPIDLY DEVELOPED MEDIUM SCALE CYCLONE
Y. Yamagishi, H. Koga, K. Kashiwagi, and K. Ninomiya (Sendai District Meteorological Observatory, Japan). *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 289-293 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

A numerical simulation of the forming and the rapid development (16hpa/12hr) of a medium scale cyclone using a model with d = 63.5 km is summarized. The cyclone is not coupled with the middle tropospheric short wave trough in the early stage of the development. Analyzing small scale features of the lower tropospheric initial wind fields is very important to predict cyclone development. Initialization procedures to solve balance equation and quasi-geostrophic omega-equation are not enough to detect

the small scale features contained in the wind field. The experiment shows that released latent heat plays an important role in the development of the cyclone. Author (ESA)

N85-10531# European Space Agency, Paris (France). Div. de Recherche en Prevision Numerique.
APPLICATIONS OF A FINITE-ELEMENT REGIONAL MODEL TO VERY-SHORT-RANGE FORECASTING
R. Benoit and P. Kocles *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 295-300 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

A finite element regional weather model was equipped with an initialization procedure, an accurate moisture advection scheme and a sophisticated boundary-layer parameterization in order to increase its potential to deliver very short-range mesoscale forecasts. The cases investigated are those of SESAME 1979 (regional scale). The short space/time scales are examined during the first 12 hr of integration. The impact of using an alternate high-resolution moisture analysis obtained by an extension of a GOES image processing technique is assessed. Grid resolution is 100 km and the mean spacing of the levels is 6 kPa, with a minimum of 250 m in the boundary layer. To provide very early guidance to forecasters, this model features thorough code vectorization and execution on a vector computer. Author (ESA)

N85-10532# Hydrometeorological Centre of the USSR (Moscow).
APPLICATION OF MESOSCALE NUMERICAL MODEL TO LOCAL WEATHER PREDICTION
V. Z. Kiselnikova, E. M. Pekelis, D. Ya. Pressman, N. F. Veltishchev, and A. A. Zhelin *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 301-307 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

A prognostic mesoscale model for short range prediction of meteorological elements over limited areas is presented. The model is based on deep convection equations and includes parameterization procedures of subgrid turbulence, radiative heating and microphysics. The physical model as a whole and its segments are described together with numerical solution procedures of the governing equations and initialization. The results on numerical tests of model segments are presented. Author (ESA)

N85-10533# Meteorological Office, Bracknell (England).
THE UNITED KINGDOM METEOROLOGICAL OFFICE MESOSCALE FORECASTING SYSTEM
B. W. Golding and N. A. Machin *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 309-314 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

A fine scale short period forecasting system for the United Kingdom is presented. The forecast model is run with a grid-length of 15 km and with 16 levels in the vertical, 5 of which are in the lowest 1 km. It uses nonhydrostatic compressible equations of motion and is integrated using a semi-implicit scheme to maintain stability of sound waves. The sub-grid scale parameterizations include surface exchanges, turbulent diffusion, precipitation and convection. Initialization is based on an interpolation from the 75 km gridlength operational regional model. Surface observations are used to add mesoscale detail to the boundary layer and the cloud field. Results are presented. Author (ESA)

N85-10534# Bulgarian Academy of Science, Sofia. Inst. of Geophysics.
NUMERICAL FORECAST OF PRESSURE FIELD BY CONSIDERING THE MUTUAL INFLUENCE OF OROGRAPHY, THERMAL NONHOMOGENEITY AND SURFACE FRICTION
N. Godev and E. Syrakov (Sofia University, Bulgaria) *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 315-319 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

Methods taking into account the simultaneous influence of orography, thermal nonhomogeneities and friction in the numerical forecast of the baric field are suggested. A theory of the horizontally nonhomogeneous planetary boundary layer in a linear and nonlinear approximation is used. An expression obtained for the vertical velocity describes synoptically important orographic and thermal effects. These effects are considered with space-time varying weight coefficients. Numerical experiments show that the approach provides a better understanding and forecasting of characteristics of the synoptic processes. Author (ESA)

N85-10535# Naval Postgraduate School, Monterey, Calif. Environmental Physics Group.
EVALUATION OF AN INTEGRATED MIXED-LAYER MODEL FOR SINGLE STATION PREDICTION IN A MARINE REGIME
P. JonesBoyle, K. L. Davidson, and G. E. Schacher *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 323-327 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

An intergrated marine atmospheric boundary layer model for predicting changes in the inversion height and mixed-layer temperature and humidity using shipboard data from observational experiments off the California coast was developed. The model is based on entrainment closure formulations and radiative flux approximations with cloud microphysical parameterizations. The model is initialized with data from a single station and was applied to 27 cases, cloud covered and clear sky. Initialization of the subsidence rate is found to be a critical factor in model performance. Results show a slight improvement in predictive skill, due mainly to skill in predicting cloud cover. Author (ESA)

N85-10536# Direction de la Meteorologie Nationale, Paris (France).
A LOCAL DYNAMICAL INTERPRETATION METHOD OF NUMERICAL WEATHER FORECASTING
L. Musson-Genon and J. P. Javelle *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 329-334 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

In order to improve forecasts from a numerical weather prediction model, a local interpretation method based on Reynolds equations is presented. It uses a one-dimensional model of the boundary layer between the ground and 2500 m level, and describes the different physical phenomena occuring in this part of the atmosphere. A large scale numerical model gives the forcing. Results are compared to measures obtained during a boundary layer experiment. It is shown that this method is a useful tool for local weather forecasting. Author (ESA)

N85-10537# Research Inst. of National Defence, Umea (Sweden).
AN OPERATIONAL NUMERICAL MODEL FOR PREDICTION OF FOG AND STRATUS
Edvard Karlsson and Jan Erik Falk (Air Force Base, Luleaa, Sweden) *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 335-340 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

A model for fog and stratus cloud forecasting based on a numerical boundary layer model was developed. The forecast period is up to 12 hrs. The model predicts fog and stratus formation in stationary weather situations (radiation fog) as well as in advective situations (advection fog). Tests show good agreement with real evolutions. The tests also show that the boundary conditions often are at least as important as the initial values of temperature and humidity. Author (ESA)

N85-10538# Swedish Military Weather Service, Stockholm.
A 1-DIMENSIONAL MODEL WITH A SUB-GRID SCALE CONDENSATION SCHEME FOR STRATIFORM CLOUDS AND FOG
Gustav Grandin *In* ESA Nowcasting 2. Mesoscale Observations

and Very-Short-Term Weather Forecasting Jun. 1984 p 341-345 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

A one-dimensional second-order closure model was used for stratus and fog studies. Schemes for sub-grid condensation, radiation processes and surface energy balance were introduced. Sensitivity studies of the consequence of changes in different parameters were made. When the appropriate parameters are used the model tests show realistic results compared with the measured data. Author (ESA)

N85-10539# Swedish Military Weather Service, Stockholm.
AN OPERATIONAL FORECASTING SYSTEM FOR STRATUS AND FOG WITH SODAR
Hans Dahlquist *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 347-351 (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

Fog and stratus radiation models for aviation weather forecasts were developed for sodar based forecasting. Two dimensional orographical stratus and fog theory is summarized. Model application is illustrated. Author (ESA)

N85-10540# Deutscher Wetterdienst, Offenbach am Main (West Germany).
PREPARATION STEPS FOR THE USE OF ONE-DIMENSIONAL INTERPRETATION MODELS FOR NOWCASTING PURPOSES IN THE GERMAN WEATHER NET
P. vanPander *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 353-358 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

The use of numerical models in meteorology is reviewed. One-dimensional fog and convection models are described. Because of their restriction to one dimension they can simulate short-range physical processes in more detail than the routinely used forecasting models. Author (ESA)

N85-10541# Washington Univ., Seattle. Dept. of Atmospheric Sciences.
A ONE-LEVEL MESOSCALE MODEL SUITABLE FOR NOWCASTING AND SHORT-TERM FORECASTING IN REGIONS OF COMPLEX TERRAIN
Clifford F. Mass and David P. Dempsey *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 359-364 refs Sponsored by Naval Environmental Prediction Research Facility (For primary document see N85-10487 01-47)
(Grant NSF ATM-82-05390)
Avail: NTIS HC A23/MF A01

A one-level sigma coordinate model for diagnostic surface winds in regions of complex terrain and land/water contrast is described. The model requires only modest computer resources and needs little data for initialization. Two model runs and corresponding observed wind fields are presented. They indicate that the model can diagnose many details of the mesoscale flow given the large scale forcing, the appropriate topography, and a reasonable diabatic heating/cooling rate. Author (ESA)

N85-10542# National Severe Storms Lab., Norman, Okla. National Severe Storms Lab.
A SHORT-TERM FORECAST MODEL FOR THUNDERSTORM ROTATION
R. Davies-Jones, R. Rabin, and K. Brewster *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 367-371 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

A physical model which uses a nearby environmental sounding and observed storm motion to quantify the potential of strong thunderstorms for producing mesocyclones is presented. The model predicts the correlation coefficient between vertical vorticity and vertical velocity at each level, as deduced from linear theory of thermal convection in vertical wind shear. The basic premise is that vertical drafts generate vertical vorticity within the storm by tilting of horizontal vortex tubes, associated with the environmental wind shear. From an environmental sounding, a layer-averaged (0 to 3 km) correlation is computed as a function of all feasible storm speeds (0 to 30 m/sec) and directions. Contours of average correlation coefficient plotted on a storm speed versus direction diagram can be used with observed (or anticipated) storm motion to nowcast the development of net updraft rotation. Author (ESA)

N85-10543# South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
BOUNDARY LAYER-CLOUD INTERACTIONS AS POTENTIAL STORM PREDICTORS
Andre A. Doneaud, James R. Miller, and David L. Priegnitz *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 373-378 refs Sponsored by South Dakota Government (For primary document see N85-10487 01-47)
(Contract DOI-8-07-83-V0009; Grant NSF ATM-82-19473)
Avail: NTIS HC A23/MF A01

Data from a surface mesonet in a semi-arid zone are used to explore interactive mechanisms between storms and their environment. A formula calculating the total moisture inflow into the cloud in which areal convergence time interval (ACTI) plays an important role is suggested. The ACTI might be used as a potential predictor for the beginning time of the storm. A semidiurnal cycle in the variance of the net divergence field over the network is revealed in dry days. The cycle is disturbed in stormy days. The perturbed cyclicity is a potential predictor for storms. Author (ESA)

N85-10544# Pennsylvania State Univ., University Park. Dept. of Meteorology.
SHORT-TERM FORECASTING USING A REMOS APPROACH
Gregory S. Forbes, Robert L. Scheinhartz, Ernesto Araujo, Walter D. Lottes, and John J. Cahir *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 379-384 refs (For primary document see N85-10487 01-47)
(Contracts F19628-82-K-0023; N00014-80-C-0954; Grants NSF ATM-78-02699; NA82AA-H-00027)
Avail: NTIS HC A23/MF A01

Results are summarized. from experiments aimed at determining whether meso-alpha-scale weather systems can be predicted via statistical schemes which use only synoptic-scale data and forecasts from operational numerical models. It is argued that there are gains to be made by developing regression equations for a number of weather regimes, as opposed to generalized equations. In many cases an existing mesoscale regime can be identified using satellite imagery, but in other instances (and prior to the formation of the mesoscale system) it becomes necessary to formulate an objective scheme to classify the regime. Examples of Appalachian cold-air damming, polar vortices, and short-term cloudiness forecasting are cited. Author (ESA)

N85-10545# Nanjing Meteorological Coll. (China). Weather and Climate Research Inst.
EXPERIMENT ON NOWCASTING OF HEAVY RAINFALL AND SEVERE STORMS IN CENTRAL CHINA IN 1979-1981
Zhang Yan *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 389-393 refs Prepared in cooperation with Human Meteorological Bureau, People's Republic of China, Nanjing Meteorological College, People's Republic of China, and Yangtze River Project Office, People's Republic of China (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

Experiments on nowcasting heavy rainfall and severe storms were carried out during three summers. The atmospheric/physical properties of the heat, kinetics, and moisture conditions, along with the sub-synoptic and meso-analyses of severe weather were

studied. An example of very short-range forecasting and nowcasting of heavy rainfall is described. Author (ESA)

N85-10546# Naval Environmental Prediction Research Facility, Monterey, Calif.
OPERATIONAL USE OF SHIPBOARD NUMERICAL AID PROGRAMS
Terry Brown *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 395-398 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

Computer programs which form part of a US Navy system for weather analysis and forecasting are described. The system is used operationally aboard ships. A program to analyze radiosonde observations and one to assess the probability of encountering strong winds near tropical cyclones are described. Author (ESA)

N85-10547# Atmospheric Environment Service, Vancouver (British Columbia). Pacific Weather Center.
A SUMMARY OF OPERATIONAL DEVELOPMENTS IN NOWCASTING AND SHORT-RANGE FORECASTING TECHNIQUES ON THE CANADIAN WEST COAST
G. E. Wells *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 399-404 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

Short-range forecasting (0 to 12 hr) of mesoscale weather in Canada, where conventional data is very sparse in areas such as the north and off the west coast, is described. The man-machine mix and integration of all types of data are integral to developing very short-range forecasting techniques. Like many other weather services, the development and real-time application of these techniques in Canada are in their early stages. Disseminating information to the user requires study not only of the technological perspective, but also of philosophical and policy issues. Author (ESA)

N85-10548# Osservatorio Ticinese, Locarno-Monti (Switzerland).
SIMPLE METHODS IN VERY SHORT-RANGE FORECASTING BASED ON DATA FROM A MESOSCALE NETWORK OF AUTOMATIC STATIONS (ANETZ) AND FROM SATELLITE (METEOSAT) AND RADAR
Hans Peter Roesli *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 405-409 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

Four simple methods for very-short-range forecasting in use at the Swiss Meteorological Institute are discussed. The results of methods are computer products based on data from the Swiss network of automatic weather stations (ANETZ) and from Meteosat. They are used operationally, and their results are automatically presented to the forecasters. Author (ESA)

N85-10549# Japan Meteorological Agency, Tokyo. Forecast Div.
OPERATIONAL PRECIPITATION OBSERVATION SYSTEM USING DIGITIZED RADAR AND RAIN GAGES
Y. Takemura, K. Takase, and Y. Makihara *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 411-416 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

The Japan Meteorological Agency National Weather Watch project to modernize the weather information system to improve meteorological services is introduced. Under this project radar observations are to be automated and radar information digitized and transmitted to a data processing center. The information obtained by radar are objectively analyzed together with rain gage data obtained from an automatic mesoscale surface observation system and the products are disseminated to users in the form of high speed facsimiles. Examples of nowcasting precipitation are presented. Author (ESA)

N85-10550# Direction de la Meteorologie Nationale, Magny les Hameaux (France).
THE FRENCH WEATHER RADAR NETWORK: A STATUS REPORT
Marc Gilet *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 417-422 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

The French meteorological service weather radar project (ARAMIS) is described. The objectives are to obtain a better real time knowledge of the repartition of rain areas and to improve short term forecasts. The network includes 11 existing radars. Each radar is equipped with a digital system for antenna control, data acquisition, and image transmission using telephone lines. The data are composited every 15 min at the weather service forecast center together with Meteosat data, which are received every 30 min. Radar mosaics and satellite images are transmitted towards the meteorological stations and other users, using dedicated lines and a low cost terminal designed for image reception, the METEOTEL terminal. Author (ESA)

N85-10551# Direction de la Meteorologie Nationale, Paris (France).
A SYSTEM FOR METEOROLOGICAL SATELLITE, RADAR, CONVENTIONAL DATA AND MODEL ANALYSIS
Jean Tardieu, Daniel Rousseau, and Jean-Marc Audouin *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 423-425 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

It is shown how meteorological image processing can be extended to include the output of numerical weather forecasting models. It is better to represent the meteorological network data and the forecast model results by images. To facilitate comparative analyses, it is best to project satellite and radar images in the same map projection as used for the model output (e.g., the standard projections). A faster and more complete analysis is obtained by visualizing the model output field at every time step. The animation of two-dimensional images can be seen as a three-dimensional cut in the four-dimensional model space. Author (ESA)

N85-10552# Royal Signals and Radar Establishment, Malvern (England). Meteorological Office Radar Research Lab.
FRONTIERS: PROGRESS WITH A SYSTEM FOR NOWCASTING RAIN
K. M. Carpenter and K. A. Browning *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasts Jun. 1984 p 427-432 refs Original contains color illustrations (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

The FRONTIERS Interactive Display System was designed for analysis and very-short-range forecasting of precipitation. Each half hour the forecaster operating the system has to consider three broad problems: use of the radar data to estimate surface rainfall, use of Meteosat data to extend the coverage, and the generation of extrapolation forecasts. Products include quality controlled radar rainfall analyses, rainfall actuals over a large area derived from a combination of radar network and Meteosat imagery, and rainfall forecasts for a period of 1 to 6 hr. Design aspects and operator opinions are discussed. Author (ESA)

N85-10553# National Oceanic and Atmospheric Administration, Madison, Wis.
NOWCASTING: ADVANCES WITH McIDAS 3
W. L. Smith, G. S. Wade, W. P. Menzel, V. E. Suomi (Space Science and Engineering Center), R. J. Fox (Space Science and Engineering Center), C. S. Velden (Space Science and Engineering Center), and J. F. LeMarshall (Bureau of Meteorology, Melbourne) *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 433-438 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

The Man-computer Interactive Data Access System (McIDAS) nowcast products developed for experimental use by operational severe weather forecast centers are described. The McIDAS III nowcasting functions vary from the video display of animated satellite or radar imagery to the execution of a mesoscale primitive equation forecast model. The model is initialized with locally processed satellite vertical soundings and tracer winds blended with conventional observations in order to provide objective limited area weather forecasts out to 24 hr. The McIDAS III is operated on a routine basis to provide experimental nowcast products to the National Severe Storms Forecast Center and the National Hurricane Center in the United States. Author (ESA)

N85-10554# Academia Sinica, Peking (China). Inst. of Atmospheric Physics.

DEVELOPMENT OF NOWCASTING IN CHINA

Fengxian Zhou and Zhenhua Ma *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 439-442 refs (For primary document see N85-10487 01-47)

Avail: NTIS HC A23/MF A01

Computer-based nowcasting of thunderstorms, strong winds, heavy rain, and hailstorms in China is discussed. The meteorological service uses a version of the Man-computer Interactive Data Access System. Effort is concentrated on the hardware interfaces to input satellite, radar, lidar, and sodar data and on software development. A minisystem based on microcomputers for local weather services is in progress. A severe weather case is presented to show the nowcasting problem Chinese meteorologists face. Author (ESA)

N85-10555# National Oceanic and Atmospheric Administration, Boulder, Colo.

PROFS: AN APPROACH TO IMPROVED OPERATIONAL WEATHER SERVICES

Alexander E. MacDolnald *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 443-449 refs (For primary document see N85-10487 01-47)

Avail: NTIS HC A23/MF A01

The Program for Regional Observing and Forecasting Services (PROFS) mission to improve operational weather services by the transfer of scientific and technological advances is introduced. It is oriented toward improving short-range forecasting by integrated use of existing and new observational sources, combined with new processing and human interactive capabilities. A methodology is developed in which new elements with operational potential are tested in realistic forecast exercises. Operational agencies benefit from PROFS' experience by joint programs for specification, design and development. Results from the PROFS 1983 Exercise suggest substantial improvements of weather warnings can be expected from the advanced systems being planned. Author (ESA)

N85-10556# National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.

A SUBJECTIVE EVALUATION OF THE PROFS OPERATIONAL WORKSTATION BASED UPON A REAL-TIME FORECASTING EXPERIMENT IN SUMMER 1983

Thomas W. Schlatter, Paul J. Schultz, and John M. Brown *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 451-458 refs (For primary document see N85-10487 01-47)

Avail: NTIS HC A23/MF A01

A color graphics device which displays meteorological data from many different sources on four spatial scales ranging from national (United States) to local (small portion of northeast Colorado) was assessed by forecasters who used it regularly to issue severe weather warnings and make very short-range probability forecasts of strong winds and precipitation. Forecasters may display different data on common map projections and animate any display at will. Forecasters agree that the ability to observe mesoscale phenomena in great detail leads to better extrapolative forecasts. Forecasting development of new convection remains a challenge, but precursors such as old outflow boundaries can frequently be identified and used successfully in predicting new development. Forecasters stressed the need for more thorough training in the interpretation of the images on the screen, particularly Doppler radar data, and for greater understanding of mesoscale phenomena. Author (ESA)

N85-10557# Air Force Geophysics Lab., Hanscom AFB, Mass. Atmospheric Prediction Branch.

INTERACTIVE COMPUTER DISPLAY SYSTEMS IN NOWCASTING

Donald A. Chisholm and Arthur J. Jackson *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 459-464 refs (For primary document see N85-10487 01-47)

Avail: NTIS HC A23/MF A01

A mesoscale terminal forecast experiment (MFE) was conducted using the Man-computer Interactive Data Access System system data (conventional and remotely-sensed) from 20 winter storms. The MFE assessed display and analysis products, remotely-sensed data sources and forecaster skill. Products judged to be most useful included four-quadrant conventional geographic data displays; a station model time-series-display; mesoscale surface objective analyses; and a forecast guidance procedure based on 2-D trajectories and cloud and precipitation algorithms based on GOES imagery. The GOES imagery was used to prepare cloud cover, 6-hr quantitative precipitation forecasts and ceiling height forecasts more than any other data source. The forecasts (ranging from 1 to 10 hr) are consistently better than persistence probability and sample climatology. Author (ESA)

N85-10558*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

MERIT: A MAN/COMPUTER DATA MANAGEMENT AND ENHANCEMENT SYSTEM FOR UPPER AIR NOWCASTING/FORECASTING IN THE UNITED STATES

Robert Steinberg *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 465-471 refs (For primary document see N85-10487 01-47)

Avail: NTIS HC A23/MF A01

It is suggested that the very short range forecast problem for aviation is one of data management rather than model development and the possibility of improving the aviation forecast using current technology is underlined. The MERIT concept of modeling technology, and advanced man/computer interactive data management and enhancement techniques to provide a tailored, accurate and timely forecast for aviation is outlined. The MERIT includes utilization of the Langrangian approach, extensive use of the automated aircraft report to complement the present data base and provide the most current observations; and the concept that a 2 to 12 hour forecast provided every 3 hr can meet the domestic needs of aviation instead of the present 18 and 24 hr forecast provided every 12 hr. Author (ESA)

N85-10559# Swedish Meteorological and Hydrological Inst., Norkoeping.

DEVELOPMENT OF AN OPERATIONAL SYSTEM FOR VERY-SHORT-RANGE FORECASTING (VSRF) AT SWEDISH METEOROLOGICAL AND HYDROLOGICAL INSTITUTE (SMHI)

Nils Gustafsson and Haakan Toernevik *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 473-477 refs (For primary document see N85-10487 01-47)

Avail: NTIS HC A23/MF A01

The basis of a system for very short-range weather forecasting is presented. Results from development of a mesoscale objective analysis scheme and from testing of a dynamic model for simulating surface winds are summarized. Results indicate an ability of these subsystems to recover mesoscale features. Author (ESA)

N85-10560# Swedish Meteorological and Hydrological Inst., Norkoeping.
PROMIS 600: THE PILOT PROJECT FOR THE FUTURE SWEDISH WEATHER SERVICE
Svante Bodin, Sverker Magnusson, and Lars Moen *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 479-484 refs Original contains color illustrations (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

A pilot station for the Swedish network of six regional offices for very short-range weather forecasting is presented. The network includes Doppler weather radar, a NOAA-Meteosat data processing system, a lightning location system, automatic weather stations, and a radiosonde station. Data processing and display systems and the workstation are described. Author (ESA)

N85-10561# Finnish Meteorological Office, Helsinki.
PROJECT COST 72 (THE EUROPEAN WEATHER RADAR PROJECT) TODAY
Jorma Riissanen *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 485-487 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

Nine countries signed the Memorandum of Understanding of the project COST/72 (The European weather radar network). The basic planning and study led to a concrete pilot project by which the value of radar and satellite data as exchanged between various countries is studied. After the pilot project concrete outlines for the European weather radar network will be formulated. It is expected that a short extension of the project until the end of 1985 is necessary after which the implementation project of the radar network can start. Author (ESA)

N85-10562# Oregon State Univ., Corvallis. Dept. of Atmospheric Sciences.
USER REQUIREMENTS FOR VERY-SHORT-RANGE WEATHER FORECASTS: SOME KEY ISSUES
Allan H. Murphy and Barbara G. Brown (National Center for Atmospheric Research) *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 491-494 refs (For primary document see N85-10487 01-47)
(Grant NSF ATM-82-09713)
Avail: NTIS HC A23/MF A01

The types of information that are needed about very short range weather forecast user requirements, the way in which such information should be obtained and used, and the desirable characteristics of requirements studies are discussed. Directions for research in the area of user requirements are indicated. Author (ESA)

N85-10563# Linkoeping Univ. (Sweden). Dept. of Management and Economics.
USE OF SHORT-RANGE WEATHER FORECASTS AT CONSTRUCTION SITES: SOME RESULTS FROM A USER AND A MARKET TEST
Clas Wahlbin *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 495-501 refs (For primary document see N85-10487 01-47)
(Grants SWEDCBR-800029-9; SWEDCBR-820094-0)
Avail: NTIS HC A23/MF A01

During the development of forecasts for the construction industry, user and market tests were conducted. The forecasts are used in cost-loss decisions, and for general planning and control. Analysis of cost-loss decisions gives an estimate of 1 per mille savings in cost during the winter period. Test market users' guesstimate of total economic value gives 1 to 2 per mille savings. The total estimated value is seven times the cost. Untapped potential may be represented by warnings for adverse weather, and by users learning to make full use of the forecasts. Author (ESA)

N85-10564# Swedish Meteorological and Hydrological Inst., Norkoeping.
BENEFITS RESULTING FROM TAILORED VERY-SHORT-RANGE FORECASTS IN SWEDEN
Erik Liljas *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 503-507 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

Increased demand for very short-range forecasts is discussed as well as the importance of increased effort to study user requirements and economic outcome from forecast products. Information about investigations on user requirements is given. Agriculture, transport and construction are the most affected by mesoscale weather events. Author (ESA)

N85-10565# Linkoeping Univ. (Sweden). Dept. of Mathematics.
ON PROBABILITY FORECASTS FOR TEMPERATURE
Urban Hjorth and Lars Holmqvist *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 509-512 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

Arguments are given for constructing probability distributions for the prediction of meteorological variable. Such distributions may have both mean values and uncertainty depending on the weather situation. Theoretically, they approximate the conditional distributions or predicted quantities given the observations. For the approximations heteroscedastic regression models are used. Applications to the prediction of minimum temperatures are given and results in terms of probability statements corresponding to practical needs are demonstrated. Author (ESA)

N85-10566# Swiss Inst. of Meteorology, Zurich.
SOME ASPECTS OF MATCHING NOWCASTING AND VERY-SHORT-RANGE FORECASTING (VSRF) PRODUCTS WITH THE NEED OF A MULTILINGUAL COMMUNITY OF A MOUNTAINOUS COUNTRY
P. Rauh *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 513-515 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

Nowcasting needs of a trilingual mountain community were surveyed. The opinion polls indicate that need for nowcasts and very short range forecasts depends on the extent to which the weather influences human activities rather than on language differences. New products should not be introduced as regularly updated bulletins but as warnings - short and to the point - with a minimum of delay, effort and expense, and a maximum of reliability. Author (ESA)

N85-10567# Finnish Meteorological Office, Helsinki. Area Weather Service Development.
VIDEOTEX AND WEATHER SERVICES: FINNISH APPLICATIONS
Auli Keskinen *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Range Weather Forecasting Jun. 1984 p 517-520 refs (For primary document see N85-10487 01-47)
Avail: NTIS HC A23/MF A01

Videotex systems and their uses in weather services are presented. An automatic Videotex System which telemonitors automatic weather stations and which is used for local road weather services is described. The videotex updates and delivers graphical and real time data to users with varying needs by a visual and interactive easy-to-use means of communication. Author (ESA)

N85-10568# New York State Univ., Albany.
NOWCASTING USING LIGHTNING LOCATION TECHNIQUES
Richard E. Orville *In* ESA Nowcasting 2. Mesoscale Observations and Very-Short-Term Weather Forecasting Jun. 1984 p 523-524 refs (For primary document see N85-10487 01-47)
(Contract NA3AA-D-00042; Grant NSF ATM-80-2653303)
Avail: NTIS HC A23/MF A01

A magnetic direction-finding network for the detection of

lightning cloud-to-ground strikes was installed along the East Coast of the United States. Half the population of the United States is covered by the system that records the time, location, flash polarity, stroke count, and peak signal amplitude in real time. Data are distributed to National Weather Service Offices to evaluate the potential for short range forecasting. Initial results show that the lightning activity frequently provides the first indication of a storm when compared with radar and satellite information. This result is due, in part, to the real-time capability that provides lightning strike information to forecasters within 15 sec of flash occurrence.
Author (ESA)

N85-10569# Naval Environmental Prediction Research Facility, Monterey, Calif.
STATISTICAL TROPICAL CYCLONE FORECASTING TECHNIQUES FOR THE SOUTHERN HEMISPHERE Final Report
T. D. Keenan Jun. 1984 54 p
(AD-A144752; NEPRF-TR-84-07) Avail: NTIS HC A04/MF A01 CSCL 04/2

Statistical models for forecasting Southern Hemisphere tropical cyclones were adapted, developed and tested for use by the Joint Typhoon Warning Center, Guam. On the limited sample, it was apparent that the Australian aids used in the evaluation were able to provide better forecasts than the JTWC aids. Operational trials of the Australian aids for at least two Southern Hemisphere tropical cyclone seasons are recommended. This report is divided into two parts, each with its own summary and conclusions: Part 1, Evaluation of Several Australian Statistical Tropical Cyclone Forecasting Techniques for Use at Joint Typhoon Warning Center; and Part 2, Development and Testing of New Statistical Forecasting Techniques for the Southern Hemisphere. Author (GRA)

N85-10570# Science Applications, Inc., Monterey, Calif.
SETTING HURRICANE CONDITIONS OF READINESS WITH HIGH CONFIDENCE Final Report
G. Kostyshack and J. Jarrell May 1984 37 p
(Contract N00228-83-C-3079)
(AD-A144785; NEPRF-CR-84-02) Avail: NTIS HC A03/MF A01 CSCL 04/2

A procedure for setting hurricane readiness conditions with a high degree of reliability is described. The methodology utilizes a large number of computer-simulated forecasts for actual hurricanes since 1899 that passed near Key West, FL or Guantanamo Bay, Cuba. Wind probabilities were computed from these forecasts assuming present-day official forecast error characteristics, and then compared to hindsight estimates of actual winds. These data were used to establish hurricane condition thresholds at desired levels of confidence as related to wind probability. Threshold values for 95% confidence are given for hurricane readiness conditions at Key West and Guantanamo Bay. GRA

N85-10571# Air Force Global Weather Central, Offutt AFB, Nebraska.
AUTOMATED AIRCRAFT ICING FORECAST TECHNIQUE Final Project Report
M. V. Mansur 31 May 1984 73 p
(AD-A144853; AD-E850732; AFGWC-PR-84-001) Avail: NTIS HC A04/MF A01 CSCL 04/2

This project report provides a comprehensive overview of the state of the art in icing forecasting and its associated problems. It describes the attempt to automate a manual icing forecast technique. The weaknesses, software design and algorithms are discussed. Attempts to filter out what was felt to be excess areal coverage, as produced by other automated procedures, was unsuccessful. Moderating the filtering resulted in a sieve effect with no better results than forecasts already produced by other automated methods. Final examination revealed other reasons for the poor performance in the automated mode. The manual technique had the advantage of human pattern recognition which is vastly superior to the coarse mesh grid data used in this study, as well as access to frontal positions. There were some valuable lessons learned regarding theoretical limitations to skill scores and the inherent limitations of the models. GRA

N85-10572# Naval Postgraduate School, Monterey, Calif.
SOME ASPECTS OF POST-FRONTAL CONVECTIVE AREAS ALONG THE WEST COAST OF THE UNITED STATES Final Report, Oct. 1982 - Sep. 1983
F. J. Winninghoff and R. L. Elsberry Dec. 1983 40 p
(F59-551)
(AD-A144895; NPS63-84-005) Avail: NTIS HC A03/MF A01 CSCL 04/2

The European Center for medium-Range Weather Forecasts (ECMWF) Level III-b analyses are used to study cases of post-frontal convective areas that occurred off the West Coast of the United States. A five-year climatology suggests than an average of about 13 convective events occurs each winter, and that two of three cases are likely to have intense and well-organized convection. Five events that occurred during the First Special Observing Period of the First GARP Global Experiment are selected for detailed study, Associations are sought between the post-frontal convective areas and standard synoptic and dynamic variables. The convection appears to be closely tied to the position of the upper level cold trough. Cold advection aloft and low-level heating as the cold air streams over the warmer ocean contribute to maintenance of low static stability in the convective region. The feasibility of diagnosing the location of the convective regions is explored with diabatic and frictional parameterizations of the Naval Operational Global Atmospheric Prediction System (NOGAPS). Wind, temperature, geopotential and moisture fields from the ECMWF are used to specify the large-scale forcing. The cumulus precipitation diagnosed by the NOGAPS does agree surprisingly well with the post-frontal convective areas in these five cases. Author (GRA)

N85-10573# California Univ., Livermore. Lawrence Livermore Lab.
FUTURE SCENARIOS AND OZONE CHANGE
Donald J. Wuebbles Jul. 1984 7 p
(Contract W-7405-eng-48)
(DE84-014781; UCID-20128) Avail: NTIS HC A02/MF A01

The effect of future scenarios for emissions of chlorocarbons, CO2, CH4, N2O and NO sub x were calculated with the LLNL 1-D model. Several chlorocarbon scenarios were examined. For CO2, the scenario used is based on the NRC analysis, with CO2 assumed to reach 770 ppMv by 2100. For CH4 and N2O, concentrations are assumed to increase 0.5%/yr and 0.2%/yr, respectively, based on recent measured trends. The NO sub x emissions are based on presently available estimates of aircraft emissions until 1990 NO sub x emissions are assumed unchanged after 1990. Model calculations which include the effect of chlorocarbon emissions of the CICs at 1982 levels, gives a steady state ozone change of -4.6% including temperature feedback effects. When the effect of other trace gases known to have presently increasing concentrations (CO2, CH4, N2O, NO sub x) are included in scenario A, a small increase in total ozone is calculated for the next 70 years. However, significant decreases in total ozone could result if chlorocarbon emissions were to increase by as much as 3%/yr. Declining chlorocarbon emissions (3%/yr) would add slightly to the increases in total ozone. DOE

N85-10574# Pacific Northwest Lab., Richland, Wash.
ALPINE METEOROLOGY: TRANSLATIONS OF CLASSIC CONTRIBUTIONS BY WAGNER, A., EKHART, E. AND DEFANT, F.
C. D. Whiteman, ed. and E. Dreiseitl, ed. Jun. 1984 129 p refs
(DE84-014929; PNL-5141; ASCOT-84-3) Avail: NTIS HC A07/MF A01

Research papers in Alpine meteorology are presented. The papers include: Theory and Observation of Periodic Mountain Winds, Contributions to Alpine Meteorology, On the thermal Structure of the Mountain Atmosphere, A Theory of Slope Winds, Along with Remarks on the Theory of Mountain Winds and Valley Winds. Four recent Alpine meteorology field experiments are summarized. The four experiments include the Innsbruck Slope Wind Experiment of 1978, the MESOKLIP Experiment of 1979, the DISKUS Experiment of 1980, and the ALPEX/MERKUR Experiment of 1982. R.S.F.

N85-10575# Fondazione Ugo Bordoni, Rome (Italy).
THE PLUVIOMETRIC RECORDING STATIONS IN THE 11 GHz RADIO LINK AT INVIOLETELLA MONTE S. PANCRAZIO [LE STATIONI DI REGISTRAZIONE DEI DATI PLUVIOMETRICI SULLA TRATTA AD 11 GHz INVIOLATELLA-MONTE S. PANCRAZIO]
Amedeo Volponi Apr. 1983 21 p refs In ITALIAN
(FUB-6-1983) Avail: NTIS HC A02/MF A01

Rain measuring and recording systems are described. The radio link is 54 km long with 1000 m level difference. The meteorological stations are equidistant (18 km) and placed on the axis of the Fresnel ellipsoid. The controls and periodic calibration of the instruments are detailed. Author (ESA)

N85-10576# National Weather Service, Garden City, N.Y. Scientific Services Div.
SEVERE WEATHER STATISTICS STADTS DECODER (SXW) AND PLOTTER (SWY)
Hugh M. Stone Jun. 1984 47 p
(PB84-213693; NOAA-NWS-ERCP-23; NOAA-84062801) Avail: NTIS HC A03/MF A01 CSCL 04B

The need to compare observed severe weather events to meteorological fields that are associated with the cause of the severe weather is discussed. This is useful for local research studies or for briefing purposes. The preliminary list of severe weather events for the preceding 24 hours is available each morning in the AFOS product STADTS from the National Severe Storms Forecast Center. The programs SWX and SWY provide a means of obtaining a plot and listing of severe weather events for any time period with a possible geographic restriction. The program SWX reads the AFOS product STADTS and writes a decoded version to the file SVWX0. The program SWY reads the file SVWX0 to produce a plot of severe weather events for the required time period; this is stored as AFOS product NMCGP-HSWX. Severe weather events plotted are also written to the file SVWX2. GRA

N85-10577# Illinois Dept. of Energy and Natural Resources, Springfield.
ILLINOIS CLIMATE: TRENDS, IMPACTS AND ISSUES
Beverly Sherer, ed. 15 Mar. 1984 274 p Proc. of the 12th Ann. ENR (Energy and Natural Resources) Conf., Urbana-Champaign, Ill., 13-14 Sep. 1983
(PB84-211986; ILENR/RE-84/05) Avail: NTIS HC A12/MF A01 CSCL 04B

Areas discussed were Illinois' climate during the past 10,000 years up to the present and the theories regarding both a warm future climate and a cold future climate. Also examined were the effects of air pollution and climate upon insect pests and their movement. The impacts of changes in the carbon dioxide levels upon agriculture and current studies of acid rain issues were also presented. Also included are biographies of the speakers and a brief history of the Department of Energy and Natural Resources. GRA

N85-10578# National Weather Service, Kansas City, Mo.
INVESTIGATION OF SUMMERTIME CONVECTION OVER THE UPPER CURRENT RIVER VALLEY OF SOUTHEAST MISSOURI
Bartlett C. Hagemeyer Jul. 1984 42 p
(PB84-222389; NOAA-TM-NWS-CR-71; NOAA-84072309) Avail: NTIS HC A03/MF A01 CSCL 04B

The topography of the Upper Current River Valley UCRV and the reasons why it would be a preferred area for thunderstorm development are discussed. The general synoptic conditions on the days of known occurrences are presented along with a means of objectively forecasting thunderstorm development over the area. GRA

N85-10579# National Oceanic and Atmospheric Administration, Washington, D. C. Satellite Applications Lab.
A TROPICAL CYCLONE PRECIPITATION ESTIMATION TECHNIQUE USING GEOSTATIONARY SATELLITE DATA
LeRoy E. Spayd, Jr. and Roderick A. Scofield Jul. 1984 42 p refs
(PB84-226703; NOAA/TM/NESDIS-5; NOAA-84072502) Avail: NTIS HC A03/MF A01 CSCL 04B

A technique is described for estimating precipitation from tropical cyclones using visible and infrared geostationary satellite data. The technique assigns rainfall rates to tropical cyclone cloud features, yields a rainfall potential of the cyclone prior to landfall and hourly rainfall estimates during landfall. These estimates are compared with ground truth precipitation reports and operationally produced rainfall estimates using the Scofield/Oliver convective technique for hurricanes. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N85-10580*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE MARINE RESOURCES EXPERIMENT PROGRAM (MAREX)
Dec. 1982 119 p refs
(NASA-TM-87368; NAS 1.15:87368) Avail: NTIS HC A06/MF A01 CSCL 08C

The Satellite Ocean Color Science Working Group was established to consider the scientific utility of repeated satellite measurements of ocean color, especially for measuring global ocean chlorophyll and for studying the fate of global primary productivity in the sea. Results of the group's deliberations are presented. The scientific requirements are given for ocean color data from a CZCS follow on sensor in order to address global primary productivity, fishery, and carbon storage problems. Some specific experiments, called the marine resource experiment and designed to determine critical nutrient fluxes, photosynthetic rates, and primary productivity and biomass, are outlined. R.S.F.

N85-10581# National Research Inst. for Oceanology, Stellenbosch (South Africa).
ESTUARIES OF THE CAPE. PART 2: SYNOPSES OF AVAILABLE INFORMATION ON INDIVIDUAL SYSTEMS. REPORT 12: BUFFELS (WES) (CSW 1), ELSIES (CSW 2), SIR LOWRY'S PASS (CSW8), STEENBRAS (CSW 9), AND BUFFELS (OOS) (CSW 11)
T. J. E. Heinecken, I. B. Bickerton, P. D. Morant, A. E. F. Heydorn, ed., and J. R. Grindley, ed. Dec. 1982 80 p refs Original contains color illustrations
(CSIR-RR-411-Pt-2; ISBN-0-7988-1812-3; ISBN-0-7988-1813-1; ISBN-0-7988-2218-X; Rept-12) Avail: NTIS HC A05/MF A01

Information is summarized on various aspects of the estuaries in the Buffels, Elsies, Sir Lowry's pass, and Steenbras regions of the Cape area of the Republic of South Africa. Rivers, water pollution, erosion, plants, and animals are among the topics discussed. R.J.F.

N85-10582# National Research Inst. for Oceanology, Stellenbosch (South Africa). National Research Inst. for Oceanology.
ESTUARIES OF THE CAPE. PART 2: SYNOPSES OF AVAILABLE INFORMATION ON INDIVIDUAL SYSTEMS. REPORT 13: SILVERMINE (CSW 3)
T. J. E. Heinecken, comp., A. E. F. Heydorn, ed., and J. R. Grindley, ed. Sep. 1982 49 p refs Original contains color illustrations
(CSIR-RR-412-Pt-2; ISBN-0-7988-1812-3; ISBN-0-7988-1813-1; ISBN-0-7988-2219-8; Rept-13) Avail: NTIS HC A03/MF A01

The estuaries of the Cape (of Good Hope) and their individual systems are described. The function of estuarines systems under variable conditions prevalent along the South African coastline was investigated. Long term research on selected estuarine systems is described. Topics described include: historical background; location; abiotic characteristics; biological characteristics. E.A.K.

N85-10583# National Research Inst. for Oceanology, Stellenbosch (South Africa). Estuarine and Coastal Research Unit.

ESTUARIES OF THE CAPE. PART 2: SYNOPSES OF AVAILABLE INFORMATION ON INDIVIDUAL SYSTEMS. REPORT NO. 14: SAND (CSW 4)
P. D. Morant, comp. and J. R. Grindley, comp. Cape Town Dec. 1982 77 p refs Original contains color illustrations
(CSIR-RR-413-Pt-2; ISBN-0-7988-1812-3; ISBN-0-7988-1813-1; ISBN-0-7988-2572-3) Avail: NTIS HC A05/MF A01

Information is summarized on various aspects of the Sandvlei estuaries of the Cape region of the Republic of South Africa. Among the topics discussed are rivers, public health, land ownership and use, water pollution, plants and animals. R.J.F.

N85-10584# National Research Inst. for Oceanology, Stellenbosch (South Africa). Estuarine and Coastal Research Unit.
ESTUARIES OF THE CAPE. PART 2: SYNOPSES OF AVAILABLE INFORMATION ON INDIVIDUAL SYSTEMS. REPORT NO. 15: ZEEKOE (CSW 5)
I. B. Bickerton, A. E. F. Heydorn, ed., and J. R. Grindley, ed. (Cape Town Univ.) Cape Town Dec. 1982 61 p refs Original contains color illustrations
(CSIR-RR-414-Pt-2; ISBN-0-7988-1812-3; ISBN-0-7988-1813-1; ISBN-0-7988-2573-1) Avail: NTIS HC A04/MF A01

Information is summarized on various aspects of the Zeekoe estuaries of the Cape region of the Republic South Africa. Among the topics discussed are rivers, public health, land ownership and use, water pollution, plants, and animals. R.J.F.

N85-10585# National Research Inst. for Oceanology, Stellenbosch (South Africa). Estuarine and Coastal Research Unit.
ESTUARIES OF THE CAPE. PART 2: SYNOPSES OF AVAILABLE INFORMATION ON INDIVIDUAL SYSTEMS. REPORT NO. 16: EERSTE (CSW 6)
J. R. Grindley, comp., A. E. F. Heydorn, ed., and J. R. Grindley, ed. Cape Town Dec. 1982 57 p refs Original contains color illustrations
(CSIR-RR-415-Pt-2; ISBN-0-7988-1812-3; ISBN-0-7988-1813-1; ISBN-0-7988-2574-X) Avail: NTIS HC A04/MF A01

The estuaries of the Cape of Good Hope and information on individual systems are reviewed. The following subjects were examined: historical background; location; abiotic characteristics; and biotic characterics. E.A.K.

N85-10586# National Research Inst. for Oceanology, Stellenbosch (South Africa). Estuarine and Coastal Research Unit.
ESTUARIES OF THE CAPE. PART 2: SYNOPSES OF AVAILABLE INFORMATION ON INDIVIDUAL SYSTEMS. REPORT NO. 17: LOURENS (CSW 7)
S. Cliff and J. R. Grindley Cape Town Oct. 1982 45 p refs Original contains color illustrations
(CSIR-RR-416-Pt-2; ISBN-0-7988-1812-3; ISBN-0-7988-1813-1; ISBN-0-7988-2575-8) Avail: NTIS HC A03/MF A01

A synthesis of available information concerning the estuaries of the Cape of Good Hope of South Africa is presented. Subjects of discussion include: history of the region, sedimentation, chemistry of the estuaries, flora, and fauna. Appendices are provided that cover vegetation mapping, species abundance of zooplankton, and checklists of amphibians, reptiles, birds and mammals. M.A.C.

N85-10587# National Research Inst. for Oceanology, Stellenbosch (South Africa). Estuarine and Coastal Research Unit.
ESTUARIES OF THE CAPE. PART 2: SYNOPSES OF AVAILABLE INFORMATION ON INDIVIDUAL SYSTEMS. REPORT NO. 18: BOT/KLEINMOND SYSTEM (CSW 13)
K. Koop, comp., A. E. F. Heydorn, ed., and J. R. Grindley, ed. Cape Town Sep. 1982 69 p refs Original contains color illustrations
(CSIR-RR-417-Pt-2; ISBN-0-7988-1812-3; ISBN-0-7988-1813-1; ISBN-0-7988-2576-6) Avail: NTIS HC A04/MF A01

A catalog of available information on the Botriviervlei and Kleinmond estuaries of South Africa is presented. Information includes geographic and water flow patterns, physico/chemical characteristics, and land use as well as records on flora and fauna of the region. M.A.C.

N85-10588# National Research Inst. for Oceanology, Stellenbosch (South Africa). Estuarine and Coastal Research Unit.
ESTUARIES OF THE CAPE. PART 2: SYNPOSES OF AVAILABLE INFORMATION ON INDIVIDUAL SYSTEMS. REPORT NO. 19: GROOT (WES) (CMS 23) AND SOUT (CMS 22)
P. D. Morant, I. B. Bickerton, A. E. F. Heydorn, ed., and J. R. Grindley, ed. (Cape Town Univ.) Jun. 1983 61 p refs Original contains color illustrations
(CSIR-RR-418; ISBN-0-7988-1812-3; ISBN-0-7988-1813-1; ISBN-0-7988-2585-5) Avail: NTIS HC A04/MF A01

Information on the Greek and South Estuaries is summarized. Historical background, abiatic characteristics, river catchment, flora, fauna, maps, and aerial photographs are described. B.G.

N85-10589# National Research Inst. for Oceanology, Stellenbosch (South Africa). Physical Oceanography Div.
SEA-LEVEL IN THE WORLD OCEAN. PART 5: THE NORTH-EAST PACIFIC AND ARCTIC OCEANS, A CATALOGUE OF MEASUREMENTS
J. R. E. Lutjeharms, comp. and M. M. Alheit, comp. Aug. 1983 186 p refs
(CSIR-T/SEA-8303-5) Avail: NTIS HC A09/MF A01

Information of available measurements of the sea level of the world ocean is presented. The information includes the durations of such measurements, their geographic locations, their instrumentation, institutional origins and where these data are at present available; information which is at present only to be found scattered throughout a large number of publications, reports and unpublished material. Some of the sea level records are available in the database of the Permanent Service for Mean Sea Level. E.R.

N85-10590# National Research Inst. for Oceanology, Stellenbosch (South Africa). Physical Oceanography Div.
SEA-LEVEL IN THE WORLD OCEAN. PART 6: THE SOUTH ATLANTIC AND SOUTH PACIFIC OCEANS, A CATALOGUE OF MEASUREMENTS
J. R. E. Lutjeharms and M. M. Alheit Aug. 1983 186 p refs
(CSIR-T/SEA-8303-6) Avail: NTIS HC A09/MF A01

A catalog of available measurements of the sea-level of the South Atlantic and South Pacific oceans is presented. The durations of the measurements, their geographic locations, their instrumentation, institutional origins and where these data are available at present are included. M.A.C.

N85-10591# National Research Inst. for Oceanology, Stellenbosch (South Africa). Physical Oceanography Div.
SEA-LEVEL IN THE WORLD OCEAN. PART 7: THE INDIAN OCEAN, A CATALOGUE OF MEASUREMENTS
J. R. E. Lutjeharms and M. M. Alheit Aug. 1983 132 p refs
(CSIR-T/SEA-8303-7) Avail: NTIS HC A07/MF A01

A compendium of information of available measurements of the sea-level of the Indian Ocean is presented. The information includes the durations of such measurements, their geographic locations, their instrumentation, institutional origins and where these data are at present available. Some small degree of overlap with the South Atlantic and Pacific Oceans is allowed. M.A.C.

N85-10592# Naval Ocean Research and Development Activity, Bay St. Louis, Miss.
SEAFLOOR GEOSCIENCES DIVISION: MISSIONS, TECHNICAL SPECIALTIES, ACCOMPLISHMENTS, AND ACTIVITIES, CALENDAR YEAR 1983
F. L. Nastav and R. H. Bennett Jul. 1984 38 p
(AD-A144849; AD-E751084; NORDA-TN-281) Avail: NTIS HC A03/MF A01 CSCL 08/10

The Seafloor Geosciences Division now provides the Navy with expanded and advanced capabilities to conduct comprehensive geological, geophysical, and geotechnical investigations of the sea floor and sub-sea floor. Basic and applied research studies contribute to the fundamental knowledge of the oceanic crust and overlying sediments and the effective utilization of the sea floor. Interdisciplinary seafloor science and engineering

investigations are ongoing in support of Navy problems, systems design, construction, and operations. Studies provide quantitative and qualitative description and understanding of the seafloor geological materials and environmental parameters and directed toward advancing the state-of-the-art. GRA

N85-10593# Hawaii Inst. of Geophysics, Honolulu.
AN IMPROVED ANALYTICAL THEORY OF ROSSBY WAVE DRIVEN EULERIAN AND LAGRANGIAN MEAN FLOWS ALONG NON-ZONAL BARRIERS WITH APPLICATION TO THE HAWAIIAN RIDGE
I. S. Oh and L. Magaard May 1984 20 p
(Contract N00014-82-C-0380)
(AD-A144951; HIG-84-1) Avail: NTIS HC A02/MF A01 CSCL 08/3

We study the reflection of baroclinic Rossby waves from a non-zonal barrier. In doing so we improve and extend an analytical study by Mysak and Magaard (1983). We add lateral friction to their model and obtain not only a more realistic Eulerian secondary flow, but we also calculate the Stokes drift of the total Rossby wave field. We apply our improved and extended model to the Hawaiian Ridge where the incident wave field is known (magaard, 1983). Compared to the case of vanishing lateral friction, the Eulerian mean flow now shows smaller current speeds and wider current bands. The narrow eastward jet in the immediate neighborhood of the Ridge is now replaced by a much weaker, broader eastward flow. The subsequent western boundary current and eastward countercurrent are now shifted farther away from the Ridge in better agreement with White's (1983) analysis of historical temperature data. The Lagrangian mean flow is stronger than the Eulerian mean flow. Within the first 100 km off the Ridge the two flows are mostly in opposite directions. Author (GRA)

N85-10594# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
SEA ICE DATA BUOYS IN THE WEDDELL SEA Report, for Dec. 1978 - Nov. 1980
S. F. Ackley and E. T. Holt May 1984 25 p
(Grants NSF DPP-80-06922; NSF DPP-77-24528)
(AD-A144953; CRREL-84-11) Avail: NTIS HC A02/MF A01 CSCL 08/3

Data obtained from two sets of data buoys either air-dropped or deployed by ship onto the Weddell Sea pack ice during the period from Dec 1978 to Nov 1980 are presented. The buoy data include position, pressure and temperature information and to date represent the most complete combined weather and pack ice drift records for the ice-covered Southern Ocean regions. The buoys tended to drift north initially and then to turn east generally between latitudes 62 deg S and 64 deg S. Buoy 1433 turned east farther south at approximately 67 deg S but at about the same time as buoy 0527, implying that the westerly wind belt was farther south than usual in 1979. The range of air pressure, from about 950 mb to about 10200 mb, is typical of the circumpolar low pressure trough in the Southern Hemisphere. All buoys were equipped with an internal or compartment temperature sensor. The 1980 buoys also contained an external air temperature sensor in a ventilated, shielded can at 1-m height. Although differences of 10 C or more between recorded air and compartment temperatures are common, the correlation between the two measured temperatures is generally very good. The compartment temperatures are higher probably because the buoy is radiationally heated. We found that subtracting 3 C from the average daily compartment temperature yielded a good estimate of the average air temperature for any given day. This technique can be used to construct average daily air temperature records for the 1979 buoys which only contained the internal or compartment temperature sensor. GRA

N85-10595# North Carolina Univ., Chapel Hill.
THE GULF STREAM DEFLECTION AND MEANDER ENERGETICS EXPERIMENT. CURRENT METER AND BOTTOM PRESSURE GAUGE DATA REPORT FOR THE SEPTEMBER, 1981 TO APRIL, 1982 MOORING PERIOD
J. M. Bane and W. K. Dewar Dec. 1983 398 p
(Contract N00014-77-C-0354)
(AD-A144977; CMS-83-2) Avail: NTIS HC A17/MF A01 CSCL 08/3

The gulf stream deflection and meander energetics experiment was undertaken to study time-dependent fluctuations of the gulf stream and their relationship to its structure. Horizontal flow speed and direction, pressure, temperature, and conductivity were measured. Temperature and conductivity were combined to infer salinity, and from this sea water density was calculated. The counts of these parameters were written on the tape using a series of variably spaced pulses. The data was edited to remove randomly spaced gaps in individual variables as well as deletions of entire records. Also, the null data were replaced with linearly interpolated data. Vector velocities were inferred from speed and direction. The primary objective was to measure the several day lower frequency gulf stream fluctuations. To obtain appropriate data, the 3HRLP time series were filtered a second time. S.B.

N85-10596# Naval Research Lab., Washington, D. C.
A DESCRIPTION AND DISCUSSION OF FREDDEX OCEANOGRAPHIC MEASUREMENTS Interim Report
J. M. Bergin 19 Jun. 1984 23 p
(AD-A145032; AD-E000587; NRL-MR-5359) Avail: NTIS HC A02/MF A01 CSCL 08/3

During the time interval March June 1979 an experiment called FREDDEX (Front and Eddy Experiment) was conducted in the Atlantic Ocean, north of Bermuda, as a cooperative effort between several organizations and involved measurements made from satellite, aircraft, and three ships. The purpose of FREDDEX was to conduct extensive measurements on the oceanographic characteristics of an ocean eddy and the influence this feature has on long range underwater acoustic transmission. This report discusses various salient aspects of the oceanographic measurements. Results are given for horizontal and vertical temperature structure of the eddy as well as evidence for the rotation of the basic temperature anomaly associated with the eddy. A novel technique is described of utilizing the ensemble of measurements in order to extend the data to the ocean bottom, thereby achieving a complete description of the sound speed profile in the vertical. GRA

N85-10597# Marine Research Inst., Helsinki (Finland).
INVESTIGATION OF ICE DYNAMICS IN THE MARGINAL ICE ZONE Interim Report, 18 Sep. 1983 - 31 May 1984
M. Leppaeranta and W. D. Hibler, III. Aug. 1984 26 p
(Contract DAJA45-83-C-0034; DA Proj. IT1-61102-BH-57)
(AD-A145110; IR-4) Avail: NTIS HC A03/MF A01 CSCL 08/12

The report consists of an initial analysis of the ice kinematics field data from MIZEX-83 Greenland Sea Study. The data set consists of distance measurements accurate to 1-2 metres between Del Norte units at five sites, with one site being the ship. The data set represents a unique set of measurements of the deformation field of a series of interacting floes. GRA

N85-10598# Woods Hole Oceanographic Institution, Mass. Dept. of Chemistry.
THE MARINE GEOCHEMISTRY OF THE RARE EARTH ELEMENTS Ph.D. Thesis
Hein J. W. DEBaar Sep. 1983 283 p
(Contracts N00014-82-C-0019; DE-AS02-76EV03566; NR Proj. 083-004)
(AD-A145132; WHOI-83-45) Avail: NTIS HC A13/MF A01 CSCL 08/10

Novel methods were developed for the determination of 12 of the 14 Rare Earth Elements (REE) in seawater. Initial extractions of the REE by chelating ion exchange chromatography is followed by cation exchange for removal of co-extracted U and remaining traces of major ions. Finally traces of U are removed by anion exchange before irradiation for 8 hours at a flux of 5 x 10 to the 13th power neutrons 1 sq. cm./sec. After post-irradiation separation of 24Na, the gamma spectra are recorded over four different time intervals with a Ge(Li) detector. An internal standard (144Ce) is carried all along the procedure for improved precision by avoidance

of counting geometry errors. Vertical profiles are reported for three stations in respectively the Northwest Atlantic Ocean, the Eastern Equatorial Pacific Ocean and the Cariaco Trench, an anoxic basin. This data set represents the first detailed profiles of Pr, Tb, Ho, Tm and Lu in seawater, together with profiles of La, Ce, Nd, Sm, Eu, Gd, and Yb. The first observations of positive Ce anomalies in seawater are ascribed to regeneration of Ce under reducing conditions. The first reported positive Gd anomalies are ascribed to the unique chemical properties of the Gd(III)-cation, which has an exactly half-filled 4f electron shell. GRA

N85-10599# Woods Hole Oceanographic Institution, Mass.
OBSERVATIONS OF THE VERTICAL STRUCTURE OF THE EDDY FIELD IN THE KUROSHIO EXTENSION
W. J. Schmitz, Jr. 20 Jul. 1984 11 p Repr. from J. of Geophysical Research, v. 89, no. C4, 20 Jul. 1984 p 6355-6364
(Contract N00014-76-C-0197)
(AD-A145178; WHOI-CONTRIB-5480) Avail: NTIS HC A02/MF A01 CSCL 08/3

A year long mooring with instruments spanning a depth of 350 to 6000 m at a site in the Kuroshio Extension yield an eddy field that is highly vertically coherent from the top of the thermocline to 200 m off the ocean floor at the lowest frequencies. Spectral distributions of kinetic energy (Ke) are independent of depth as a good first approximation. All eddy field characteristics have approximately the same normalized vertical distribution. The existence of more energetic weakly depth dependent bodies in the North Atlantic than in the North Pacific is discussed. The evidence presented implies the possibility of distinct dynamical patterns, vertical structure, in differing regimes and oceans. E.R.

N85-10600# Dobrocky Seatech Ltd., Sidney (British Columbia).
ANALYSIS AND INTERPRETATION OF CURRENT MEASUREMENTS FROM THE BEAUFORT SEA Final Report, Apr. - Aug. 1981
P. Greisman, A. Blaskovich, and R. Q. Robe, ed. (Coast Guard Research and Development Center, Groton, Conn.) Apr. 1984 498 p
(AD-A145197; USCG-D-18-84; CGR/DC-2/84) Avail: NTIS HC A21/MF A01 CSCL 08/3

The present view of ocean circulation in the Beaufort Sea is based principally upon dynamic heights and computed baroclinic, geostrophic currents. These computations show a vertical shear westward toward the surface. If a reference level of no motion is assumed at the bottom (or in fact any depth below 100 m), the results of these computations are in qualitative agreement with the observed westward ice drift in the southern Beaufort Sea. Recent measurements by Aagaard (in press) showed, however, that the flow on the continental shelf is eastward. The cross-slope array deployed by the USCG in 1981 was designed to locate the region where the eastward continental shelf flow vanishes and is replaced by the westward flow of the Beaufort gyre. The cross-slope array of instruments in fact demonstrated that there is no mean westward flow below 40 m depth and the Beaufort gyre is confined to the surface layers in this region. The deeper layers move eastward in the southern Beaufort, and the possibility exists that all deeper waters of the Beaufort gyre circulate in an anti-clockwise sense. Coherence spectra among various current meter records and meteorological forcings were computed. The coherence computations between a current meter record from the shelf break and (1) the direct wind stress, (2) the longshore gradient of the wind stress, and (3) the curl of the wind stress, all show a high degree of coherence (above the 95% significant level), but none of these atmospheric driving forces appears to dominate. Large events in the current records in July appear uncorrelated with atmospheric processes. GRA

N85-10601# Institute of Oceanographic Sciences, Wormley (England).
RETURN WAVE HEIGHTS OFF SOUTH UIST ESTIMATED FROM SEVEN YEARS OF DATA
B. R. Stanron (New Zealand Oceanographic Inst.) 1984 58 p refs
(IOS-164) Avail: NTIS HC A04/MF A01

Return wave heights off South Uist (Scotland) for seven years were analyzed using the Weibull, lognormal, Fisher-Tippett (FT) type 1 and 2 distributions, and an individual wave model. The 50 yr return wave height parameters were also analyzed. Best fits are obtained with the FT-1 distribution, the 3 parameter Weibull distribution, and the individual wave model. The first two give 50 yr return values of H(max,3 hours) of 25.0m and 23.0m while the 50 yr return value of the zero up crossing wave is 25.2m from the individual wave model. Of the methods based on analysis of measured monthly or annual extremes, the one using the combined monthly maxima FT-1 distributions is preferred, and gives a return H(max,3 hours) of 26.0m. However, all these values are probably underestimated because the biggest waves were inadequately sampled. Interannual variability appears to affect model accuracy. Author (ESA)

N85-10602# National Center for Atmospheric Research, Boulder, Colo.
NUMERICAL STUDIES OF MESOSCALE EDDIES USING QUASIGEOSTROPHIC AND PRIMITIVE EQUATION OCEAN MODELS Ph.D. Thesis
Mary L. Batteen 1984 311 p refs Sponsored in part by NSF
Prepared in cooperation with Oregon State Univ.
(PB84-214048; NCAR/CT-82) Avail: NTIS HC A14/MF A01 CSCL 08C

The dynamical role of mesoscale eddies in the ocean general circulation is investigated using eddy-resolving quasigeostrophic (QG) and primitive equation (PE) models which are parametrically identical. The results of both QG and PE numerical experiments in mid-latitude, rectangular ocean basins are systematically intercompared and extensively analyzed in terms of energetics, relative and potential vorticity, and eddy momentum and heat transports. Although overall the analyses show that the results are fairly similar between the two models, a closer examination reveals some significant differences. Most of these differences are due to the presence of Kelvin waves along the lateral boundaries of the PE model. These waves are the main source for mean and eddy divergent kinetic energy. GRA

N85-10603# Evans-Hamilton, Inc., Seattle, Wash.
SYNTHESIS OF CURRENT MEASUREMENTS IN PUGET SOUND, WASHINGTON. VOLUME 1: INDEX TO CURRENT MEASUREMENTS MADE IN PUGET SOUND FROM 1908-1980 WITH DAILY AND RECORD AVERAGES FOR SELECTED MEASUREMENTS
Jeffrey M. Cox, Curtis C. Ebbesmeyer, Carol A. Coomes, Jonathan M. Helseth, Laurence R. Hinchey, Glenn A. Cannon (NOAA), and Clifford A. Barnes (Washington Univ.) May 1984 56 p refs
(PB84-214105; NOAA/TM/NOS/OMS-3-Vol-1;
NOAA-84070301-Vol-1) Avail: NTIS HC A04/MF A01 CSCL 08C

To describe the characteristics of the circulation in Puget Sound, a synthesis of historical measurements of currents, water properties, and meteorological conditions is undertaken. An index to current measurements made in Puget Sound from 1908-1980 is provided with daily and record averages for selected measurements are included. GRA

N85-10604# National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
DRIFT CHARACTERISTICS OF NORTHEASTERN BERING SEA ICE DURING 1982
Michael Reynolds and Carol H. Pease Apr. 1984 144 p refs
(PB84-213982; NOAA-TM-ERL-PMEL-55; NOAA-84062802) Avail: NTIS HC A07/MF A01 CSCL 08L

An array of 6 ARGOS drifting ice platforms were deployed in the vicinity of Nome, Alaska in the northeastern Bering Sea. Two of the platforms had meteorological and oceanographic stations which measured surface winds and currents and telemetered the data to the GOES-West satellite. During this time the NOAA WP-3D instrumented airplane made three flights over this area and out to the ice edge. The ARGOS platforms were allowed to drift freely and terminated in the ice pack due to ice deformation or to melt

out. The two platforms in Norton Sound oscillated north and south on the same time scales as the others but were restricted to the spatial scales of western Norton Sound. GRA

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N85-10605# Japanese Air Self-Defense Force, Tokyo. Aeromedical Lab.
THE REPORTS OF AEROMEDICAL LABORATORY, VOLUME 25, NO. 1/2
Jun. 1984 85 p refs In ENGLISH and JAPANESE
(ISSN-0023-2858) Avail: NTIS HC A05/MF A01

The flying situations which induce emotional disturbances in pilots were determined. The effects of weight training on acceleration tolerance were evaluated. Psychological uneasiness and phobic tendencies in aircraft pilots were assessed. The inflating characteristics of an anti-G pressure suit for pilots were studied. The fatigue of air traffic controllers and other persons working shiftwork was measured. For individual titles, see N85-10606 through N85-10610.

N85-10606# Japanese Air Self-Defense Force, Tokyo. Aeromedical Lab.
PSYCHOLOGICAL STATES (MOOD, AFFECT OR EMOTION) EXPERIENCED BY JASDF PILOTS THROUGH FLYING DUTIES. 3: FLYING CONDITIONS CAUSING PILOTS PSYCHOLOGICAL DISTURBANCES c53
Miyako Okaue and Hisao Aruga *In its* The Repts. of Aeromedical Lab., Vol. 25, No. 1/2 Jun. 1984 p 1-14 refs In JAPANESE; ENGLISH summary (For primary document see N85-10605 01-51)
Avail: NTIS HC A05/MF A01

A questionnaire, containing both open-ended questions and sentences completion forms, was administered to JASDF pilots for the purpose of clarifying what flying situations induce emotional disturbances such as anxiety, tension, and irritancy in pilots. The analysis of the pilot responses ae summarized below. More pilots seem to feel anxiety than tension under conditions of aircraft troubles, bad weather, their own poor experiences, or insufficient preparations for flight; however, they feel tension rather than anxiety during their normal mission flight. Many pilots feel tension during taking off or landing which are regarded as some of the greatest difficulties in flight. If one-seat flighter pilots, whose flying hours in currently assigned aircraft are under 150 hours, do not fly for a month, most of them feel anxiety at the time of flying. There are aircraft which are felt to be easy or difficult to control. Whether an aircraft is felt to be easy or difficult supposedly does not depend upon a pilot's flying experience but upon characteristics of the aircraft. Irritancy during flight is experienced more by jet pilots including instructors and fighters than by rescue pilots. More fighter pilots experience solitude during flight than other multiple seat aircraft pilots. R.S.F.

N85-10607# Japanese Air Self-Defense Force, Tokyo. Aeromedical Lab.
THE EFFECTS OF ISOTONIC TRAINING ON +Gz TOLERANCE c52
Chieko Mizumoto and Masaaki Iwane *In its* The Repts. of Aeromedical Lab., Vol. 25, No. 1/2 Jun. 1984 p 15-30 refs In JAPANESE; ENGLISH summary (For primary document see N85-10605 01-51)
Avail: NTIS HC A05/MF A01

The effects of isotonic training on the tolerance to + Gz were evaluated. Five healthy, sedentary men aged from 20 to 31 performed the weight training program consisting of nine exercises: leg press, bench press, back extension, chin up, leg curl, straight arm pulldown, shoulder shrug, sit up, and arm curl. The main results obtained include: (1) muscle strength including back strength, grip strength, and leg strength increased significantly with the training; (2) the tolerance to gradual onset run exposure increased by 0.4 to 0.9G in four subjects and did not change in one; (3) the tolerance to rapid onset run (ROR) exposure increased by 1.0 to 1.5G in two subjects, did not change in two, and decreased in one by 0.5G; and (4) the correlation between the tolerance to ROR exposure and the weight of one maximum repetition of leg press was statistically significant. It is concluded that the weight training, especially the leg press, was effective in improving the G tolerance. R.S.F.

N85-10608# Japanese Air Self-Defense Force, Tokyo. Aeromedical Lab.
THE RELATIONSHIP BETWEEN EMOTIONAL TENSION SCALE AND PSYCHOLOGICAL UNEASINESS OF JASDF PILOTS IN FLYING SITUATIONS c53
Miyako Okaue and Hisao Aruga *In its* The Repts. of Aeromedical Lab., Vol. 25, No. 1/2 Jun. 1984 p 31-46 In JAPANESE; ENGLISH summary (For primary document see N85-10605 01-51)
Avail: NTIS HC A05/MF A01

A questionnaire to survey JASDF pilot's emotional experiences through flying duty assessment and the Emotional Tension Scale was administered to 173 JASDF pilots. The Emotional Tension Scale is a questionaire to evaluate emotional tensions or anxieties which are supposed to effect behaviors in frustrating situations. The questions about fiting situations consisted of multiple choice and sentence completion type. Answers given by the pilots were converted to Z scores, and Pearson's product moment correlation coefficients were computed. Results suggest that: (1) younger pilots tend to be less stable psychologically; (2) the Emotional Tension Scale cannot be used to project pilot psychological uneasinesses in actual flying; (3) the Emotional Tension Scale score is related to the frequency of reluctancy to fly and the uneasiness before flying; (4) question items inquiring of phobic tendencies and physical complaints in the Scale have significant correlation with the frequency of reluctancy to fly; and those of obsessive tendencies and of social phobic tendencies slightly correlate with the psychological uneasiness before flying; and (5) phobic experiences during flying have no relations with any other item, therefore every pilot has the possibility to have such experiences, regardless of his age, flight hours, or psychological traits. R.S.F.

N85-10609# Japanese Air Self-Defense Force, Tokyo. Aeromedical Lab.
ASSESSMENT OF THE INFLATING CHARACTERISTICS OF THE MODIFIED ANTI-G SUIT c54
Akihiko Onozawa, Wataru Ogawa, Shoji Ogata, Masashi Oshibuchi, Mikio Ono, and Masaaki Iwane *In its* The Repts. of Aeromedical Lab., Vol. 25, No. 1/2 Jun. 1984 p 47-64 refs In JAPANESE; ENGLISH summary (For primary document see N85-10605 01-51)
Avail: NTIS HC A05/MF A01

A modified anti-G suit developed in light of rapid onset G rates was made. The inflating characteristics of the modifid anti-G suit were assessed by human centrifuge test, ground test, and flight test. According to the measurement of inflation time, change of inner pressure, and pressure error score in each bladder, the modified anti-G suit responded to the rapid onset G rate. Human subjects could not distinguish between the inflating characteristics between a JASDF standard suit and a modified suit. The modified anti-G inflates with a rapid velocity of inner pressure of each bladder without differences between inner pressure of ech bladder and outer pressure to the body surface. The modified suit inflates smoothly without any unbalance. According to pilots' comments, the modified suit was superior in fitness, but no differences in G-tolerance between the standard and the modified one were reported. In conclusion, it is necessary to develop a ready pressure valve and new anti-G systems for enhancement of G-tolerance of the fighter pilots. R.S.F.

N85-10610# Japanese Air Self-Defense Force, Tokyo. Aeromedical Lab.
A STUDY OF FATIGUE OF SHIFTWORKERS IN AIR TRAFFIC CONTROL AND WEATHER SERVICE GROUPS IN JASDF c52
Osamu Fujiwara, Yukiko Kakimoto, Miyako Okaue, Akio Nakamura, Hisao Aruga, Yoshinori Takeuchi, Fumiko Tajima, Izo Sakurai, and

Shoji Shimizu *In its* The Repts. of Aeromedical Lab., Vol. 25, No. 1/2 Jun. 1984 p 65-85 refs In JAPANESE; ENGLISH summary (For primary document see N85-10605 01-51)
Avail: NTIS HC A05/MF A01

The fatigue of air traffic controllers and weather service persons working shiftwork was investigated. Subjective fatigue, flicker value, urinary excretion of 17-OHCS, heart rate, and sleep surveys were used for a fatigue assessment scale. Cornel Medica Index (CMI) and fatigue feeling surveys were also carried out. Results suggest that: (1) fatigue resulting from one cycle of shiftwork was largely offset by off duty rest; (2) normal circadian rhythms were frequently disturbed in weather observers and teletype operators who had to k through midnight without a sleep; (3) there was no difference in average sleeping time between daytime workers and shiftworkers; (4) fatigue complaints among shiftworkers tended to increase in over forty-one years old; and (5) 3.6% of air traffic controllers and weather service persons diagnosed to be neurotic by the CMI tended to have stronger fatigue feeling and sleep-related dissatisfaction. R.S.F.

N85-10611# Joint Publications Research Service, Arlington, Va.
USSR REPORT: SPACE BIOLOGY AND AEROSPACE MEDICINE, VOLUME 18, NO. 4, JULY - AUGUST 1984
O. G. Gazenko, ed. 2 Oct. 1984 143 p refs Transl. into ENGLISH of Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 4, Jul. - Aug. 1984
(JPRS-USB-84-006) Avail: NTIS HC A07

News items, abstracts and articles from scientific reports on aspects of space biology and aerospace medicine are covered including the role of deconditioning of resistive vessels; effects of weightlessness; computer techniques; hemodynamics; hyperoxia; hypokinesia; lipid metabolism; muscular functions; toxicology; long term space flight; and bone demineralization. For individual titles, see N85-10612 through N85-10631.

N85-10612# Joint Publications Research Service, Arlington, Va.
CIRCULATORY ORTHOSTATIC INSTABILITY: ROLE OF DECONDITIONING OF RESISTIVE VESSELS
V. M. Khayutin, S. M. Shenderov, A. G. Zakharov, and A. N. Rogoza *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 4, Jul. - Aug. 1984 (JPRS-USB-84-006) 2 Oct. 1984 p 1-11 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 4, Jul. - Aug. 1984 p 4-12 (For primary document see N85-10611 01-51)
Avail: NTIS HC A07

One of the effects of weightlessness on the circulatory system, i.e., reduction of the tension distending resistance vessels due to the loss of hydrostatic pressure, was simulated. For this purpose the abdominal aorta of rats was constricted by a wire spiral. As a result, the arterial pressure in the posterior body decreased by 30 to 50%. Beginning with postoperation day 7 the hydraulic resistance of resistance vessels of hindlimbs was decreased progressively and the myogenic regulation of their lumen was inhibited. The response to the stimulation of vasoconstrictive fibers of the sciatic nerve that was reduced 7 to 14 days after operation returned to normal 90 days later. An examination of the tail arteries demonstrated that the ability of their muscular layer to withstand the distending effect of the physiologically normal pressure was impaired. The magnitude of the constrictor reaction to norepinephrine (particularly to its moderate concentrations) was lowered. These changes may play an important role in the orthostatic disorders of circulation that occur after exposure to weightlessness. Author

N85-10613# Joint Publications Research Service, Arlington, Va.
HEMOPOIESIS IN RATS SUBMITTED TO WEIGHTLESSNESS
V. N. Shvets, A. Vacek, G. I. Kozinets, I. I. Britvan, V. I. Korolkov, and N. A. Chelnaya *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 4, Jul. - Aug. 1984 (JPRS-USB-84-006) 2 Oct. 1984 p 12-17 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 4, Jul. - Aug. 1984 p 12-16 (For primary document see N85-10611 01-51)
Avail: NTIS HC A07

Experimental data on the erythropoiesis of rats flown on Cosmos biosatellites for 18 to 22 days are summarized. The histogenesis of the hemopoietic tissue is investigated at the level of stem cells, dividing maturing pool and mature blood cells (erythrocytes). In weightlessness inhibition of the erythropoiesis in various skeletal sites occurs. Flight data are compared with hemopoietic findings in hypokinetic rats. Possible mechanisms underlying red blood disorders in humans during spaceflight are discussed. Author

N85-10614# Joint Publications Research Service, Arlington, Va.
POTENTIAL USE OF DIALOGUE WITH COMPUTERS IN BIOMEDICAL RESEARCH c61
T. M. Smirnova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 4, Jul. - Aug. 1984 (JPRS-USB-84-006) 2 Oct. 1984 p 18-22 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 4, Jul. - Aug. 1984 p 16-19 (For primary document see N85-10611 01-51)
Avail: NTIS HC A07

Problems involved in the development of interaction software for biomedical investigations and in the preparation of experimenters for using a computer in the interactive mode are discussed. An interaction program for data analysis is suggested. The program is used to build an interactive modification that makes it possible to carry out a computer aided verification of the mechanisms of erythropoiesis regulation in spaceflight. A simple interactive terminal facility can be employed in the software of biomedical investigations, taking into account changes in the requirements placed by users and their experience of computer interaction. Author

N85-10615# Joint Publications Research Service, Arlington, Va.
VITAMIN METABOLISM IN COSMONAUTS FOLLOWING SHORT-TERM FLIGHTS c52
M. S. Belakovskiy, N. D. Radchenko, and N. G. Bogdanov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 4, Jul. - Aug. 1984 (JPRS-USB-84-006) 2 Oct. 1984 p 23-27 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 4, Jul. - Aug. 1984 p 19-22 (For primary document see N85-10611 01-51)
Avail: NTIS HC A07

The vitamin status of the cosmonauts after short term (4 to 13 days) flights showed different variations. Vitamin consumption was basically adequate to the requirements in space flights. Some vitamins were occassionally in deficiency, thus indicating their enhanced metabolization. Author

N85-10616# Joint Publications Research Service, Arlington, Va.
COMPENSATORY AND ADAPTIVE REGIONAL HEMODYNAMIC REACTIONS TO WEIGHTLESSNESS DURING LONG-TERM SPACEFLIGHTS c52
Kh. Kh. Yarullin, T. D. Vasilyeva, V. F. Turchaninova, I. V. Sokolova, and N. D. Vikharev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 4, Jul. - Aug. 1984 (JPRS-USB-84-006) 2 Oct. 1984 p 28-36 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 4, Jul. - Aug. 1984 p 22-28 (For primary document see N85-10611 01-51)
Avail: NTIS HC A07

Regional hemodynamics and vascular regulation during and after spaceflights of over 3 months in duration are discussed. Mechanisms of cardiovascular adaptation to weightlessness are described. The postflight differences in the recovery of regional hemodynamics seem to depend on the individual characteristics, age related changes of the cardiovascular system, as well as the countermeasures and rehabilitation measures performed during and after flight. Author

N85-10617# Joint Publications Research Service, Arlington, Va.
FUNCTIONAL CAPACITIES OF ELDERLY SUBJECTS EXPOSED TO SIMULATED SPACEFLIGHT FACTORS c52
T. N. Krupina, Kh. Kh. Yarullin, N. P. Artamonova, V. A. Gornago, D. A. Alekseyev, N. I. Tsyganova, M. P. Kuzmin, L. M. Filatova, L. A. Fotina, and O. A. Smirnov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 4, Jul. - Aug. 1984 (JPRS-USB-

84-006) 2 Oct. 1984 p 37-42 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 4, Jul. - Aug. 1984 p 29-32 (For primary document see N85-10611 01-51)
Avail: NTIS HC A07

In response to stimulated space flights cardiovascular and metabolic changes of 86 volunteers, aged 40 to 49 and 50 to 56, were similar to those of young people (25 to 39 years old). In most aged test subjects, the changes produced by 8 day head down tilt (-8 deg) and 7 day water immersion were moderate and reversible. This type of variation of the adaptive compensatory reactions give evidence that aged people have sufficiently high functional capabilities. Nevertheless, 36% test subjects, aged 40 to 49, and 50% test subjects, aged 50 to 56, displayed certain features suggesting a reduction of the adaptive compensatory capabilities (functional reserves) as a result of age related and atherosclerotic changes of the cardiovascular system. Author

N85-10618# Joint Publications Research Service, Arlington, Va.
EFFECT OF FLUID AND SALT SUPPLEMENTS TO FOOD ALLOWANCE ON ENDURANCE OF HEAD-TO-PELVIS ACCELERATIONS FOLLOWING 7-DAY DRY IMMERSION AND UNDER ORDINARY MOTOR ACTIVITY CONDITIONS c52
N. I. Kokova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 4, Jul. - Aug. 1984 (JPRS-USB-84-006) 2 Oct. 1984 p 43-49 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 4, Jul. - Aug. 1984 p 33-37 (For primary document see N85-10611 01-51)
Avail: NTIS HC A07

The effect of water salt supplements as an agent increasing human tolerance to head to feet acceleration with a slow onset was examined. The test subjects were rotated in a 7.25 m arm centrifuge after 7 day dry immersion or normal motor activity. The water salt supplements were given at a dose of 0.15 g NaCl and 18 ml water per kg body weight (with the total daily dose consumed in four fractions). During immersion fluid retention was significantly higher than during normal activity (818 + or - 139.7 ml versus 478 + or - 69 ml). Water salt supplements consumed produced a positive effect on tolerance to head to feet acceleration. During centrifugation after water salt supplementation the physiological responses were less strained. Water salt supplements taken on the last immersion day increased the tolerance level as compared to the control. The amount of the fluid retained in the body was found to be inversely proportional to the tolerance level. It is concluded that water salt supplements may be recommended to increase tolerance to head to feet acceleration in aerospace medicine. Author

N85-10619# Joint Publications Research Service, Arlington, Va.
FREQUENCY AND NATURE OF ELECTROCARDIOGRAPHIC DISTURBANCES IN DOGS DURING SINGLE AND REPEATED EXPOSURE TO +G SUB z ACCELERATIONS
R. A. Vartbaronov, G. D. Glod, N. N. Uglova, M. N. Khomenko, and I. S. Rolik *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 4, Jul. - Aug. 1984 (JPRS-USB-84-006) 2 Oct. 1984 p 50-55 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 4, Jul. - Aug. 1984 p 37-41 (For primary document see N85-10611 01-51)
Avail: NTIS HC A07

Pathological changes of the ECG were examined in 10 adult dogs exposed to +G(z) once a day or 3 times a week for three days a week during 2 to 12 weeks. In response to acceleration all of the dogs developed ECG changes. The frequency and level of these disorders were dependent on the acceleration magnitude and the health state that varied during repeated exposure. These findings were used to develop a 5-score scale for measuring ECG disorders and to identify phase changes in acceleration tolerance during repeated exposure to +G(z). It was also demonstrated that animals can be specifically trained to tolerate sustained and high acceleration +G(z). Author

N85-10620# Joint Publications Research Service, Arlington, Va.
EFFECT OF SPACEFLIGHT FACTORS ON RAT BONE MARROW CELLS
D. K. Benova, A. K. Bairakova, I. V. Baev, and H. G. Nikolov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 4, Jul. - Aug. 1984 (JPRS-USB-84-006) 2 Oct. 1984 p 56-59 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 4, Jul. - Aug. 1984 p 41-43 (For primary document see N85-10611 01-51)
Avail: NTIS HC A07

The effect of spaceflight factors, weightlessness in particular, on the genetic structures of bone marrow cells of rats flown for 18.5 days on Cosmos-1129 was investigated. Chromosome aberrations were measured on postflight days 6 and 25. The frequency of unstable chromosome aberrations was similar in the flight, synchronous and vivarium rats. Karyotyping of metaphase plates revealed chromosome aberrations in the flight and synchronous rats. Exposure to weightlessness did not influence the mutagenic effect in bone marrow cells of the rats. Author

N85-10621# Joint Publications Research Service, Arlington, Va.
DYNAMICS OF MORPHOLOGICAL CHANGES IN ARTICULATION NERVOUS SYSTEM UNDER HYPOKINETIC CONDITIONS AS A MODEL OF A SPACEFLIGHT FACTOR
V. I. Drobyshev, V. V. Antipov, and V. V. Makarov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 4, Jul. - Aug. 1984 (JPRS-USB-84-006) 2 Oct. 1984 p 60-68 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 4, Jul. - Aug. 1984 p 43-49 (For primary document see N85-10611 01-51)
Avail: NTIS HC A07

Using statistical treatment, a neuromorphological examination of the joint capsule of rats exposed to hypokinesia for 7, 15, 20, 30, 40 and 60 days was carried out. The exposure to 7 days caused an increase in the number of reactively changed nerve fibers and receptors. The exposure to 15 days resulted in a significant increase of the number of nerve fibers with destructive changes that involved mostly large-caliber fibers. However, 20- and, especially, 30-day hypokinesia was followed by a significant reduction of destructive changes. After 40- and 60-day exposure they again became very distinct. This suggested a wave-like pattern of structural changes. At every stage of experimental hypokinesia all the compartments of the joint nervous apparatus showed adaptive-compensatory reactions. Author

N85-10622# Joint Publications Research Service, Arlington, Va.
EFFECT OF 1,25-DIHYDROXYCHOLECALCIFEROL AND 24,25 DIHYDROXYCHOLECALCIFEROL ON GROWTH AND ALTERATION OF RAT BONES DURING HYPOKINESA (HISTOMORPHOMETRIC STUDY)
O. Ye. Kabitskaya, Z. F. Savik, A. S. Kaplanskiy, V. N. Shvets, I. N. Sergeyev, M. S. Belakovskiy, and V. B. Spirichev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 4, Jul. - Aug. 1984 (JPRS-USB-84-006) 2 Oct. 1984 p 69-76 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 4, Jul. - Aug. 1984 p 49-55 (For primary document see N85-10611 01-51)
Avail: NTIS HC A07

The tubular bones of the fore- and hindlimbs of rats immobilized for five weeks were examined morphometrically and histologically. The rats were regularly given per os 1,25(OH2D3, 24,25(OH)2D3 or their combinataion. The uptake of 24,25(OH)2D3 at a dose of 1.25 milligrams or a combination of 1,25(OH)2D3 and 24,25(OH) 2D3 at a dose of 0.03 + 0.25 milligrams led to the recovery of the linear and volume-weight rates of bone formation that changed during hypokinesia. However, these D3 metabolites did not restore the width of the epiphseal growth plate, whereas the size of the primary and secondary spongiosa returned to normal or exceeded in in response to 24,25(OH)2D3 at a dose of 1.25 milligrams and 1,25(OH)2D3 at a dose of 0.15 milligrams, respectively (only these two doses were used); in other words, the D3 metabolites prevented osteoporosis which is typical of hypokinesia. It is assumed that hypokinesia may produce either disorders in D3 metabolism or changes in the sensitivity of bone cells to active D3 metabolites and other hormones that are directly or indirectly involved in osteogenesis regulation. Author

N85-10623# Joint Publications Research Service, Arlington, Va.
DYNAMICS OF SOME PARAMETERS OF CARBOHYDRATE AND LIPID METABOLISM IN RECOVERY PERIOD FOLLOWING LONG-TERM HYPOKINESA
T. M. Lobova, P. P. Potapov, and A. V. Chernyy *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 4, Jul. - Aug. 1984 (JPRS-USB-84-006) 2 Oct. 1984 p 77-81 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 4, Jul. - Aug. 1984 p 55-58 (For primary document see N85-10611 01-51)
Avail: NTIS HC A07

Eighty-seven white rats were exposed to prolonged hypokinesia. On the 90th hypokinesia day the content of cholesterol, free fatty acids and acetone bodies increased and the content of sugar and triglycerides decreased in blood, the content of glycogen decreased and the content of cholesterol increased in liver and skeletal muscles. On the 15th day after exposure most parameters returned to normal. However, glucose-6-phosphate dehydrogenase in liver and adipose tissue increased and remained elevated till recovery day 60. On the 30th recovery day the changes were similar to those during hypokinesia. On the 90th recovery day the content of triglycerides, cholesterol and acetone bodies in blood grew and the content of triglycerides and glycogen in muscles increased. Author

N85-10624# Joint Publications Research Service, Arlington, Va.
BILIGENIC FUNCTION OF WHITE RAT LIVER
Ye. N. Panasyuk and L. N. Skakun *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 4, Jul. - Aug. 1984 (JPRS-USB-84-006) 2 Oct. 1984 p 82-88 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 4, Jul. - Aug. 1984 p 58-62 (For primary document see N85-10611 01-51)
Avail: NTIS HC A07

White male rats were exposed to hypokinesia of 4 to 30 days in duration. The exposure led to a moderate hypersecretion of gall which was more distinct in autumn and winter. The synthesis and secretion of gallic acid increased. The excretion of cholesterol also grew. The ratio of tauro- and glycoacids shifted in favor of the latter. The cholate cholesterol coefficient increased. These changes in gall formation during hypokinesia are closely related to disorders in lipid and carbohydrate metabolism, as well as in adrenal function. Author

N85-10625# Joint Publications Research Service, Arlington, Va.
EFFECT OF SHORT-TERM HYPOKINESIA ON RAT OPIOID SYSTEM REACTION
R. A. Tigranyan, O. P. Vakulina, and L. F. Panchenko *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 4, Jul. - Aug. 1984 (JPRS-USB-84-006) 2 Oct. 1984 p 89-93 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 4, Jul. - Aug. 1984 p 63-66 (For primary document see N85-10611 01-51)
Avail: NTIS HC A07

The content of methionine-enkephalin, leucine-enkephalin and beta-endorphine was measured in various brain compartments (hypophysis, hypothalamus, midbrain, medulla oblongata, striatum), the adrenals, and blood plasma of the rats exposed to single and repeated immobilization. The reaction of the opiate systems to hypokinesia was very distinct in the emotiogenic brain structures (hypothalamus and midbrain) and hypophysis. The content of opiate-like peptides varied as a function of the immobilization time, with the most distinct changes occurring at the 150th minute. After daily immobilization was repeated 40 times, adaptation to the chronic stress effect developed. Author

N85-10626# Joint Publications Research Service, Arlington, Va.
REACTION OF CEREBRAL VENTRICLES TO ANTIORTHOSTATIC POSITION AND OCCLUSION OF JUGULAR VEINS c52
V. I. Sokolov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 4, Jul. - Aug. 1984 (JPRS-USB-84-006) 2 Oct. 1984 p 94-98 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 4, Jul. - Aug. 1984 p 66-69 (For primary document see N85-10611 01-51)
Avail: NTIS HC A07

Twenty male test subjects were subdivided into two groups with respect to the reactions of their brain ventricles to a preliminary head-down test (-30 deg). Group 1 consisted of subjects who showed ventricular enlargement, headache, and nausea; group 2 included subjects without these reactions. The subjects were also exposed to tests with neck vein occlusion. The first (continuous) test was performed at +40 mm Hg for 5 min; the second (step) test was carried out from +10 to +50 mm Hg for 2 min at each step. The results obtained demonstrate that an adequate venous outflow from the cranial cavity influences brain ventricles; the data also provide evidence that changes in compensatory mechanisms are detectable using occlusion tests. Author

N85-10627# Joint Publications Research Service, Arlington, Va.
EFFECT OF MAXIMUM PHYSICAL LOAD ON OXYGEN-TRANSPORT PROPERTIES OF BLOOD c52
L. A. Ivanov and N. D. Chebotarev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 4, Jul. - Aug. 1984 (JPRS-USB-84-006) 2 Oct. 1984 p 99-104 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 4, Jul. - Aug. 1984 p 69-72 (For primary document see N85-10611 01-51)
Avail: NTIS HC A07

Ventilation, gas exchange, gas composition, and pH of venous blood, as well as oxyhemoglobin dissociation curves, were investigated during exercise tests of nine healthy male volunteers aged 19 to 31. During maximal exercises, the dissociation curve shifted to the right. The shift was associated with the extra erythrocyte factor, i.e., the Bohr effect, due to metabolic acidosis in muscles. The shift which indicates a lower hemoglobin affinity for oxygen and a higher oxygen release by the blood is of adaptive importance: during exercises oxygen supply to tissues increases. This shift is also suggested by an increase of venous pO2 during muscle work. Author

N85-10628# Joint Publications Research Service, Arlington, Va.
EFFECT OF HYPEROXIA AND INCREASED GAS ATMOSPHERE DENSITY ON CONTRACTILE FUNCTION OF THE RIGHT VENTRICLE c52
V. I. Kuleshov and Yu. V. Namlinskiy *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 4, Jul. - Aug. 1984 (JPRS-USB-84-006) 2 Oct. 1984 p 105-110 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 4, Jul. - Aug. 1984 p 73-76 (For primary document see N85-10611 01-51)
Avail: NTIS HC A07

Rheocardiography, phonocardiography, and electrocardiography were used to investigate the right ventricle function of 16 male test subjects exposed to various gas atmospheres under increased pressure. During short-term exposures, the adverse effect of an increased pressure on the contractile function of the right ventricle grew in the following order: hyperoxia-normoxic nitrogen-oxygen atmosphere--compressed air. Author

N85-10629# Joint Publications Research Service, Arlington, Va.
CHANGE IN ENERGETICS OF MUSCULAR CONTRACTION AS A RESULT OF HYPEROXIA c52
L. D. Pchelenko and N. A. Bebyakova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 4, Jul. - Aug. 1984 (JPRS-USB-84-006) 2 Oct. 1984 p 111-117 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 4, Jul. - Aug. 1984 p 77-81 (For primary document see N85-10611 01-51)
Avail: NTIS HC A07

Using a highly sensitive thermometric method, it was found that the heat production of a single isometric contraction of an isolated diaphragm of the rats exposed to 99% O2 at normal pressure for 3 and 6 hours significantly differed from the norm. After 3 hr hyperoxygenation muscle heat production increased almost three-fold, and after 6 hr of hyperoxygenation it decreased almost two-fold. The increase is regarded as a result of an

oxygen-potentiated increase of energy expenditures involved in a contraction and of a decrease of the performance of muscle contraction. The decrease is considered to be a consequence of the primary uneconomical energy expenditures by an intensively working muscle (represented by the diaphragm) and of a reduced viability of the muscle preparation incubated in vitro. Author

N85-10630# Joint Publications Research Service, Arlington, Va.
HEMODYNAMICS AND NEURODYNAMICS OF THE HUMAN BRAIN DURING EXPOSURE TO MODERATE HYPOXIC HYPOXIA c52
D. A. Alekseyev, A. F. Zubarev, T. N. Krupina, Kh. Kh. Yarullin, Ye. I. Kuznets, and M. P. Kuzmin *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 4, Jul. - Aug. 1984 (JPRS-USB-84-006) 2 Oct. 1984 p 118-125 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 4, Jul. - Aug. 1984 p 81-86 (For primary document see N85-10611 01-51)
Avail: NTIS HC A07

Synchronous electro- and rheoencephalography were used to study tolerance to moderate hypoxic hypoxia for 30 min at an altitude of 5000 m without additional oxygen supply. Test subjects were men with autonomic-vascular dystonia (29 to 39 years old), 15 men over 40 (41 to 56 years old), and 16 essentially healthy controls (23 to 36). The aged volunteers (41 to 56 years old) did not differ from the controls with respect to their tolerance to hypoxic hypoxia. The men with early symptoms of hypertonic-type dystonia also showed high tolerance to hypoxic hypoxia. The subjects with hypotonic-type dystonia displayed lower tolerance. Author

N85-10631# Joint Publications Research Service, Arlington, Va.
TOXICOLOGICAL EVALUATION OF COLUMBIA SPACECRAFT c54
W. J. Rippstein and M. E. Coleman *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 4, Jul. - Aug. 1984 (JPRS-USB-84-006) 2 Oct. 1984 p 126-138 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 4, Jul. - Aug. 1984 p 87-96 (For primary document see N85-10611 01-51)
Avail: NTIS HC A07

Atmospheric contamination of spacecraft crew cabins has been a toxicological concern since the United States began its efforts in manned spaceflight. Procedures were developed and utilized for determining the identities and quantities of contaminant gases present in the crew cabin environment. Methods were also developed for assessing and controlling the trace gas contaminant buildup within the closed environment of spacecraft cabins. Although nearly one hundred contaminant gases were detected in the shuttle crew cabin, for the most part, the concentrations of these gases were maintained below a toxicity hazard level. Author

N85-10632*# National Aeronautics and Space Administration, Washington, D. C.
FUNGI OF MT. BABIA GORA. 2: INDICATIVE VALUE OF MACROMYCETES IN FOREST ASSOCIATIONS. A: INITIAL CONSIDERATIONS
Anna Bujakiewicz Jun. 1984 83 p refs Transl. into ENGLISH from Acta Mycol. (Poland), v. 17, nos. 1-2, 1981 p 63-125 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77485; NAS 1.15:77485) Avail: NTIS HC A05/MF A01 CSCL 06C

The role and value of fungi in forest associations of Mt. Babia Gora massif were determined. The general physiographic characteristics of the research terrain, the distribution of the fungi sites, a list of the 618 taxons noted in the subalpine forests of Mt. Babia Gora, and the initial characteristics of the forest mycoflora of this massif are presented. R.S.F.

N85-10633*# National Aeronautics and Space Administration, Washington, D. C.
FUNGI OF MOUNT BABIA GORA. 3: THE INDICATING VALUE OF MACROMYCETES IN THE FOREST ASSOCIATIONS
Anna Bujakiewicz May 1984 63 p refs Transl. into ENGLISH from Acta Mcyol. (Poland), v. 18, no. 1, 1982 p 3-44 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(NASA-TM-77486; NAS 1.15:77486) Avail: NTIS HC A04/MF A01 CSCL 06C

The results of a mycological investigation of the forests of the upper mountain forest zone of Mt. Babia Gora and the synthetic characteristics of participation of macromycetes in all the forests studied are presented. Regularities and distinct connections were found in the occurrence of macromycetes on the background of various forest associations, differences in exposure, orography, climate, and changes induced by man. Author

N85-10634# Systems Research Labs., Inc., Dayton, Ohio.
PRIMATE EQUILIBRIUM PERFORMANCE AND DIAZEPAM: A BEHAVIORAL TOLERANCE EFFECT Final Technical Paper, Jan. - Aug. 1983
D. W. Blick, C. T. Bennett, and M. R. Murphy Jul. 1984 10 p
(Contract F33615-80-C-0603)
(AD-A145156; USAFSAM-TP-84-286) Avail: NTIS HC A02/MF A01 CSCL 06/15

Well-trained rhesus macaques were tested for their ability to perform a compensatory tracking task (Primate Equilibrium Platform) under the influence of diazepam. Performance decrements were observed that depended not only on the dose, but also on the amount of prior experience of the animal with the drug. Such tolerance effects make it inappropriate to use repeated measures designs to derive dose-effects functions for performance. The impact of tolerance effects on the measurement and interpretation of drug-induced performance decrements was discussed.
Author (GRA)

N85-10635# Department of the Air Force, Washington, D.C.
IN VIVO DERMAL ABSORPTION METHOD AND SYSTEM FOR LABORATORY ANIMALS Patent Application
J. N. McDougal, inventor (to Air Force) Filed 22 May 1984 17 p
(AD-D011231; US-Patent-Appl-SN-612776) Avail: NTIS HC A02/MF A01 CSCL 14/2

A method and system is described for in vivo dermal absorption testing of a laboratory animal uses a mask and harness for protecting the respiratory tract of the animal when the animal is housed within a sealed chamber with a hazardous test vapor introduced in the chamber. Because of the difficulty of getting a good seal with a protective mask on a laboratory animal, this system is designed with an air leak from inside the mask into the chamber. To ensure that the test vapor does not infiltrate the mask nor leak from the chamber, the vapor is maintained at a negative pressure within the chamber as compared to the external atmospheric pressure and air is supplied to the mask for the animal to breathe at a positive pressure and a greater rate than that needed by the animal. GRA

N85-10787# Joint Publications Research Service, Arlington, Va.
LAGGING DEVELOPMENT OF BIOTECHNOLOGY DESCRIBED
Bozena Kastory *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-84-029) 3 Aug. 1984 p 30-35 Transl. into ENGLISH from Zycie Warszawy (Warsaw), no. 4, 8 May 1984 p 3 (For primary document see N85-10783 01-70)
Avail: NTIS HC A03/MF A01

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

N85-10636* National Aeronautics and Space Administration, Washington, D. C.
SPACE MEDICINE AND BIOLOGY, CONTINUING BIBLIOGRAPHY (SUPPLEMENT 263)
Oct. 1984 114 p
(NASA-SP-7011(263); NAS 1.21:7011(263)) Avail: NTIS HC $7.00 CSCL 06E

This bibliography lists 403 reports, articles and other documents introduced into the NASA scientific and technical information system in September 1984. E.R.

N85-10637# Letterman Army Inst. of Research, San Francisco, Calif.

EFFECTS OF REPETITIVE, SMALL-SPOT, INCOHERENT LIGHT FLASHES ON PURSUIT TRACKING PERFORMANCE Final Report, Jul. - Oct. 1981

R. R. Levine, P. A. OMara, D. A. Stamper, J. W. Molchany, and D. J. Lund Jun. 1984 41 p
(DA Proj. 3E1-62777-A-878)
(AD-A144848; AD-E751084; LAIR-176) Avail: NTIS HC A03/MF A01 CSCL 06/16

The effects of repetitive, small-spot incoherent light flashes on pursuit tracking was studied in the BLASER tracking simulator under bright and dim ambient light conditions. Ten experimentally naive men served as volunteers. The target was a scale-model tank moving at a constant angular velocity of 5 mrad/sec at a simulated distance of 1 km. A series of 5 flashes, presented at a rate of 20 Hz, were presented during randomly selected tracking trials. Flashes were produced with a miniature xenon flash lamp housed within the tracking device and spatially filtered to produce a 100 micro retinal diameter spot at approximately 50% of the maximum permissible exposure level. Colored filters in front of the lamp were used to produce flashes in the red and green portions of the spectrum. Unfiltered light from the lamp produced white-light flashes. The flashes produced statistically significant increases in the horizontal standard deviation error scores. These were manifested mainly by lead or lag errors (crosshairs ahead or behind the target) in response to the flash, followed by a return to baseline error levels. The magnitude of this effect was greater in the dim viewing condition than in the bright, as measured by maximum aiming error and the temporal course of recovery. No significant effect was observed for flash color. GRA

N85-10638# Army Research Inst. of Environmental Medicine, Natick, Mass.

THE EFFECT OF NAPROXEN ON ACUTE MOUNTAIN SICKNESS AND VASCULAR RESPONSES TO HYPOXIA

R. T. Meehan, A. Cymerman, P. Rock, C. S. Fulco, and J. Hoffman 15 Aug. 1984 21 p
(AD-A145144) Avail: NTIS HC A02/MF A01 CSCL 06/15

The role of prostaglandins in the pathogenesis of acute mountain sickness and two hypoxia-induced vascular responses was evaluated using the cyclooxygenase inhibitor naproxen. Eleven males spent 24h at sea level, followed by 34h of decompression to 428 torr while receiving naproxen (N), 250 mg twice daily or placebo (P) in a double-blind crossover trial. Serum naproxen levels by high pressure liquid chromatography were not changed by hypoxia. Retinal artery diameter measured from projected fundus photographs was increased after 27h at altitude (11.4 + or - .5mm) vs sea level (9.4 + or = .5mm, p< .05) during both trials. Upright mean arterial pressure fell after 6h at altitude (79 + or - 3 mmHg during N and P vs. 92 + or - 3 at S.L., p<.01). The severity of acute mountain sickness (AMS) by the Environmental Symptoms Questionnaire scores and observer assessment were unaffected by drug treatment. Minute ventilation, and expiratory alveolar P02 and PC02 did not differ between drug trials. This study suggests vasodilating prostaglandins do not have a major role in the genesis of AMS, hypoxia-induced retinal vasodilatation, or postural blood pressure responses in man. GRA

N85-10639# Army Research Inst. of Environmental Medicine, Natick, Mass.

VOLUNTARY DEHYDRATION AND ELECTROLYTE LOSSES DURING PROLONGED EXERCISE IN THE HEAT

L. E. Armstrong, R. W. Hubbard, P. C. Szlyk, W. T. Matthew, and I. V. Sils 1984 26 p
(DA Proj. 3E1-62777-A-879)
(AD-A145157; AD-E450013) Avail: NTIS HC A03/MF A01 CSCL 06/19

The effects of water temperature and flavoring on voluntary dehydration (D), sweat electrolyte losses (SEL) and total body electrolyte losses (TBE) were studied in 12 healthy males during six hours of intermittent exercise at 40.6 C DB, 25.5 C WB. Trials involved three water temperatures (6, 22, 46 C) and two flavorings (Chlorinated and plain). Subjects (Ss) who were presented with 46 C water consumed less (p<0.0001), had a larger % body weight loss (p<0.0001), and a D which was 1050 g larger (p<000.1) than subjects who consumed 6 C. Most of the Na+ was secreted in sweat, while K+ losses primarily originated in urine. Based on 24 hour projections of total body electrolyte balance, K+ depletion was considered to be more likely than Na+ depletion because food can be easily supplemented with sodium chloride. GRA

N85-10640# Fondazione Ugo Bordoni, Rome (Italy).

A HUMAN VISUAL SYSTEM INVESTIGATION APPLICABLE TO IMAGE CONTOUR CODING [INDAGINE SUL COMPORTAMENTO DEL SISTEMA VISIVO UMANO AI FINI DELLA CODIFICAZIONE DEI CONTORNI DI FIGURE]

Roberto Cusani, Guido DiBlasio (Rome Univ.), Antonino Orlando, and Filomena Papa Dec. 1983 50 p refs In ITALIAN
(FUB-36-1983) Avail: NTIS HC A03/MF A01

A model of the human visual system, limited to the first stages of data processing is presented. The model is based on experiments using monkeys. The goal is to provide ways of reducing redundancy in image processing. Processing structures for the perception of contour linear elements are described. It is shown that image contour coding may be limited to the parameters of the acquirable elementary stimulus with non-zero output. Author (ESA)

N85-10641# Institute for Perception RVO-TNO, Soesterberg (Netherlands). Vision Group.

THE PERCEPTUAL QUALITY OF SMOKE SCREENS: AN ANALYSIS OF THE OLDEBROEK 2 TRIALS, MAY 1981

J. M. Valeton Jul. 1984 56 p refs
(Contract A79/KL/151)
(IZF-1984-20; TDCK-79369) Avail: NTIS HC A04/MF A01

Target detection by human observers with unaided vision was recorded during field trials, using hexachloroethane and white phosphorus smoke, to obtain a perceptual quality measure for a smoke screen, as a single-parameter index. Smoke was laid midway between observers and targets. Target visibility was continuously recorded. Cumulative distributions of recorded holes and obscurations were determined over 7 duration classes from 2 to 40 sec. A see-through probability for each smoke screen was obtained, and is proposed as a single-parameter quality index Q, expressed in percent: 100% is a perfect smoke screen, Q = 80 % means that there is an effective see-through probability of 20% and Q = 0% is no smoke. Author (ESA)

N85-10642# Institute for Perception RVO-TNO, Soesterberg (Netherlands). Vision Group.

THE PREDICTION OF OBSERVER RESPONSES FROM PHOTOMETRIC DATA ON SMOKE SCREENS; AN ANALYSIS OF THE OLDEBROEK 2 TRIALS, MAY 1981

J. M. Valeton Jul. 1984 19 p refs
(Contract A79/KL/151)
(IZF-1984-21; TDCK-79370) Avail: NTIS HC A02/MF A01

Photometric measurements were made on smoke screens and the visual obscuration was evaluated. The relation between photometric and observer response data was analyzed. The correlation coefficients are in the range 0.50 to 0.98. The lower values occur in events with many holes and are attributed to technical limitations in the measurement and analysis methods. It is concluded that observer scores can be predicted from photometric data. Author (ESA)

N85-10643# Southwest Research Inst., San Antonio, Tex.

MOBILE SOURCE EXPOSURE ESTIMATION Final Report, Jun. 1982 - May 1983

Melvin N. Ingalls Mar. 1984 136 p refs
(Contract EPA-68-03-3073)

(PB84-224518; EPA-460/3-84-004) Avail: NTIS HC A07/MF A01 CSCL 06E

A national exposure, in person hours, to nonreactive mobile source pollutants was analyzed. The basis for the estimate was the EPA NAAQS Exposure Model (NEM) as applied to carbon monoxide, supplemented by four mobile source microenvironments: parking garages, street canyons, on expressways, and roadway tunnels. The CO concentration distributions and national population estimates, by hour of the day, for each of these mobile source microenvironments were developed. The information was combined to determine national exposure in the microenvironments. By using the mobile source CO emission factor, exposure to mobile source pollutants based on a pollutant emission rate of one gram per minute was determined for each of the microenvironments and the environments covered by the NEM. The methodology for using this information to determine exposure to any mobile source pollutant, regulated or unregulated is explained. GRA

N85-10052*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECTS OF FOVEAL INFORMATION PROCESSING
Randall L. Harris, Sr. *In* NASA. Dryden Flight Research Center Peripheral Vision Horizon Display (PVHD) Apr. 1984 p 81-88 refs (For primary document see N85-10044 01-06)
Avail: NTIS HC A07/MF A01 CSCL 06P

N85-10607# Japanese Air Self-Defense Force, Tokyo. Aeromedical Lab.
THE EFFECTS OF ISOTONIC TRAINING ON +Gz TOLERANCE
Chieko Mizumoto and Masaaki Iwane *In its* The Repts. of Aeromedical Lab., Vol. 25, No. 1/2 Jun. 1984 p 15-30 refs In JAPANESE; ENGLISH summary (For primary document see N85-10605 01-51)
Avail: NTIS HC A05/MF A01

N85-10610# Japanese Air Self-Defense Force, Tokyo. Aeromedical Lab.
A STUDY OF FATIGUE OF SHIFTWORKERS IN AIR TRAFFIC CONTROL AND WEATHER SERVICE GROUPS IN JASDF
Osamu Fujiwara, Yukiko Kakimoto, Miyako Okaue, Akio Nakamura, Hisao Aruga, Yoshinori Takeuchi, Fumiko Tajima, Izo Sakurai, and Shoji Shimizu *In its* The Repts. of Aeromedical Lab., Vol. 25, No. 1/2 Jun. 1984 p 65-85 refs In JAPANESE; ENGLISH summary (For primary document see N85-10605 01-51)
Avail: NTIS HC A05/MF A01

N85-10615# Joint Publications Research Service, Arlington, Va.
VITAMIN METABOLISM IN COSMONAUTS FOLLOWING SHORT-TERM FLIGHTS
M. S. Belakovskiy, N. D. Radchenko, and N. G. Bogdanov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 4, Jul. - Aug. 1984 (JPRS-USB-84-006) 2 Oct. 1984 p 23-27 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 4, Jul. - Aug. 1984 p 19-22 (For primary document see N85-10611 01-51)
Avail: NTIS HC A07

N85-10616# Joint Publications Research Service, Arlington, Va.
COMPENSATORY AND ADAPTIVE REGIONAL HEMODYNAMIC REACTIONS TO WEIGHTLESSNESS DURING LONG-TERM SPACEFLIGHTS
Kh. Kh. Yarullin, T. D. Vasilyeva, V. F. Turchaninova, I. V. Sokolova, and N. D. Vikharev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 4, Jul. - Aug. 1984 (JPRS-USB-84-006) 2 Oct. 1984 p 28-36 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 4, Jul. - Aug. 1984 p 22-28 (For primary document see N85-10611 01-51)
Avail: NTIS HC A07

N85-10617# Joint Publications Research Service, Arlington, Va.
FUNCTIONAL CAPACITIES OF ELDERLY SUBJECTS EXPOSED TO SIMULATED SPACEFLIGHT FACTORS
T. N. Krupina, Kh. Kh. Yarullin, N. P. Artamonova, V. A. Gornago, D. A. Alekseyev, N. I. Tsyganova, M. P. Kuzmin, L. M. Filatova, L. A. Fotina, and O. A. Smirnov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 4, Jul. - Aug. 1984 (JPRS-USB-84-006) 2 Oct. 1984 p 37-42 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 4, Jul. - Aug. 1984 p 29-32 (For primary document see N85-10611 01-51)
Avail: NTIS HC A07

N85-10618# Joint Publications Research Service, Arlington, Va.
EFFECT OF FLUID AND SALT SUPPLEMENTS TO FOOD ALLOWANCE ON ENDURANCE OF HEAD-TO-PELVIS ACCELERATIONS FOLLOWING 7-DAY DRY IMMERSION AND UNDER ORDINARY MOTOR ACTIVITY CONDITIONS
N. I. Kokova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 4, Jul. - Aug. 1984 (JPRS-USB-84-006) 2 Oct. 1984 p 43-49 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 4, Jul. - Aug. 1984 p 33-37 (For primary document see N85-10611 01-51)
Avail: NTIS HC A07

N85-10626# Joint Publications Research Service, Arlington, Va.
REACTION OF CEREBRAL VENTRICLES TO ANTIORTHOSTATIC POSITION AND OCCLUSION OF JUGULAR VEINS
V. I. Sokolov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 4, Jul. - Aug. 1984 (JPRS-USB-84-006) 2 Oct. 1984 p 94-98 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 4, Jul. - Aug. 1984 p 66-69 (For primary document see N85-10611 01-51)
Avail: NTIS HC A07

N85-10627# Joint Publications Research Service, Arlington, Va.
EFFECT OF MAXIMUM PHYSICAL LOAD ON OXYGEN-TRANSPORT PROPERTIES OF BLOOD
L. A. Ivanov and N. D. Chebotarev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 4, Jul. - Aug. 1984 (JPRS-USB-84-006) 2 Oct. 1984 p 99-104 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 4, Jul. - Aug. 1984 p 69-72 (For primary document see N85-10611 01-51)
Avail: NTIS HC A07

N85-10628# Joint Publications Research Service, Arlington, Va.
EFFECT OF HYPEROXIA AND INCREASED GAS ATMOSPHERE DENSITY ON CONTRACTILE FUNCTION OF THE RIGHT VENTRICLE
V. I. Kuleshov and Yu. V. Namlinskiy *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 4, Jul. - Aug. 1984 (JPRS-USB-84-006) 2 Oct. 1984 p 105-110 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 4, Jul. - Aug. 1984 p 73-76 (For primary document see N85-10611 01-51)
Avail: NTIS HC A07

N85-10629# Joint Publications Research Service, Arlington, Va.
CHANGE IN ENERGETICS OF MUSCULAR CONTRACTION AS A RESULT OF HYPEROXIA
L. D. Pchelenko and N. A. Bebyakova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 4, Jul. - Aug. 1984 (JPRS-USB-84-006) 2 Oct. 1984 p 111-117 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 4, Jul. - Aug. 1984 p 77-81 (For primary document see N85-10611 01-51)
Avail: NTIS HC A07

N85-10630# Joint Publications Research Service, Arlington, Va.
HEMODYNAMICS AND NEURODYNAMICS OF THE HUMAN BRAIN DURING EXPOSURE TO MODERATE HYPOXIC HYPOXIA
D. A. Alekseyev, A. F. Zubarev, T. N. Krupina, Kh. Kh. Yarullin, Ye. I. Kuznets, and M. P. Kuzmin *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 4, Jul. - Aug. 1984 (JPRS-USB-84-006) 2 Oct. 1984 p 118-125 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 4, Jul. - Aug. 1984 p 81-86 (For primary document see N85-10611

01-51)
Avail: NTIS HC A07

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N85-10644# National Inst. for Personnel Research, Johannesburg (South Africa). Div. of Neuropsychology.
PATTERN REVERSAL VISUAL EVOKED POTENTIALS AND REACTION TIME
B. R. Mallinson and B. D. Murdoch Braamfontein, South Africa May 1983 24 p refs
(CSIR-SR-PERS-354; ISBN-0-7988-2345-3) Avail: NTIS HC A02/MF A01

The relationship between simple reaction time (RT) and the pattern-reversal visual evoked potential (PRVEP) and the effect of changes of arousal level on the latter were studied in 17 subjects. Results show increased P100 amplitude and decreased latency with increased arousal. The RT was correlated with P100 latency but not with amplitude. Differences between results and those obtained using flash VEPs are discussed. R.S.F.

N85-10645# Council for Scientific and Industrial Research, Pretoria (South Africa).
PSYCHOLOGICAL TESTING ON THE COMPUTER
T. R. Taylor 1982 36 p Presented at Assoc. Sci. and Tech. Soc. of South Africa, Pretoria, 28 Sep. 1982
(R/PERS-618) Avail: NTIS HC A03/MF A01

The National Institute for Personnel Research (NIPR) is in the process of developing a computerized psychological testing system. The programs developed for the system are divided into four categories: the control programs, the tests, test manuals and statistical procedures. The advantages and disadvantages of computerized testing are discussed. Some of the main features of NIPR computerized tests are described. Finally, one of the tests, the Arithmetic Reasoning Test, is described in some detail to illustrate the type of testing material which is being programmed on the system. Author

N85-10646# California Univ., San Diego, La Jolla. Inst. for Cognitive Science.
FEATURE DISCOVERY BY COMPETITIVE LEARNING
D. E. Rumelhart and D. Zipser Jun. 1984 54 p
(Contract N00014-79-C-0323)
(AD-A145052; ICS-8407) Avail: NTIS HC A04/MF A01 CSCL 05/10

This paper reports the results of our studies with an unsupervised learning paradigm which we have called Competitive Learning. We have examined competitive learning using both computer simulation and formal analysis and have found that when it is applied to parallel networks of neuron-like elements, many potentially useful learning tasks can be accomplished. How a very simple competitive mechanism can discover a set of feature detectors which capture important aspects of the set of stimulus input patterns. How these feature detectors can form the basis of a multi-layer system that can serve to learn categorizations of stimulus sets which are not linearly separable. How the use of correlated stimuli can be served as a kind of teaching input to the system to allow the development of feature detectors which would not develop otherwise. Competitive learning is an essentially non-associative statistical learning scheme. We certainly imagine that other kinds of learning mechanisms will be involved in the building of associations among patterns of activation in a more complete neural network. GRA

N85-10647# Denver Research Inst., Colo.
SELF-PACED INSTRUCTION. FACTORS CRITICAL TO IMPLEMENTATION IN AIR FORCE TECHNICAL TRAINING: A PRELIMINARY INQUIRY Final Technical Paper May - Sep. 1982
Barbara L. McCombs, Susan M. Back, and Anita S. West Aug. 1984 109 p
(Contract F33615-81-C-0007)
(AD-A145098; AFHRL-TP-84-23) Avail: NTIS HC A06/MF A01 CSCL 05/9

Self-paced training in the Air Force has not met with the success that had been anticipated from the controlled experiments with self-pacing reported in both the civilian and military literature. The reasons for this lack of wide-scale success were systematically investigated to identify those factors that are critical to the success of the self-paced course. Administrative and instructional factors were hypothesized from a review of the literature and were investigated through case studies of 12 courses at four Air Force technical bases. The results of this study show that it is not one but a combination of factors that primarily influences success and that management factors are more important in Air Force technical training than in the training reported in the general literature. Based on a success model generated by the study, six recommendations are provided for enhancing the successful implementation of self-paced instruction. Author (GRA)

N85-10648# Denver Research Inst., Colo.
FACTORS CRITICAL TO THE IMPLEMENTATION OF SELF-PACED INSTRUCTION: A BACKGROUND REVIEW Final Technical Paper May - Dec. 1982
S. M. Back and B. L. McCombs Aug. 1984 61 p
(Contract F33615-81-C-0007)
(AD-A145143; AFHRL-TP-84-24) Avail: NTIS HC A04/MF A01 CSCL 05/9

In a previous effort the literature pertaining to self-paced instruction was initially collected and reviewed to support a study of factors associated with the successful utilization of self-paced instruction in Air Force technical training. The purpose of this technical paper is to provide a more in-depth analysis of the literature relevant to the findings of that study. In general, the analysis of the literature revealed a high level consensus among military and civilian reports with respect to factors associated with successful implementation of self-paced instruction. GRA

N85-10649# Oregon Univ., Eugene. Dept. of Psychology.
COGNITIVE SCIENCE PROGRAM. A FRAMEWORK FOR RELATING COGNITIVE TO NEURAL SYSTEMS Final Report
M. I. Posner 15 Aug. 1984 42 p
(Contract N00014-83-K-0601; NR Proj. 667-523)
(AD-A145185; TR-84-2; ONR-84-1) Avail: NTIS HC A03/MF A01 CSCL 05/10

This paper outlines a framework for relating cognitive activities of daily life (typing, reading) to underlying neural systems. The framework uses five levels of analysis. These are as follows: task, elementary operations, components facilitation and inhibition, neural systems and cellular level. Evidence is outlined which supports the idea that component facilitations and inhibitions in performance can be systematically linked to the activity of neural populations. The evidence is in the area of spatial attention and uses results of normals and patients as well as data from surface EEG and recording of single cells during selective attention tasks. GRA

N85-10650# Oregon Univ., Eugene.
NEURAL CONTROL OF THE DIRECTION OF COVERT VISUAL ORIENTING Final Technical Report
M. I. Posner, J. Walker, F. J. Friedrick, and R. D. Rafal 15 Aug. 1984 27 p Prepared in cooperation with Good Samaritan Hospital and Medical Center, Portland, Oreg. Sponsored in part by NIMH Submitted for publication
(Contract N00014-83-K-0601; NR Proj. 667-523)
(AD-A145189; TR-84-4; ONR-84-3) Avail: NTIS HC A03/MF A01 CSCL 05/10

In cases of unilateral parietal damage patients have difficulty in handling stimuli contralateral to the lesion. Our study shows a major problem is in disengaging attention from its current focus to deal with targets in a contralateral direction irrespective of the visual field in which the target occurs. This is true for both right

and left-sided lesions. It is likely that the visual field and thus the hemisphere which first receives the target information is also important, but that is not clear in our results. The study confirms a suggestion by Kinsbourne (1977) that each hemisphere directs attention in a contralateral direction. It implies that for directing attention the two hemispheres must be constantly interchanging control and thus sharing information from the two hemifields. These studies suggest the importance of control of the location of covert attention prior to the assessment of lateralization of cognitive functions. GRA

N85-10651# Oklahoma Univ., Norman. School of Industrial Engineering.
WORKLOAD DEMAND AND CNS DEPRESSANT STRESSOR EFFFECTS ON SPATIAL ORIENTATION INFORMATION PROCESSING Final Scientific Report, 1 Apr. 1983 - 31 Mar. 1984
R. E. Schlegel Jul. 1984 77 p Prepared in cooperation with Southeastern Center for Electrical Engineering Education, St. Cloud, Fla.
(Contract F49620-82-C-0035; Grant AF-AFOSR-0181-83; AF Proj. 2313)
(AD-A145211; AFOSR-84-0759TR) Avail: NTIS HC A05/MF A01 CSCL 05/10

An important element of piloting high-performance jet aircraft is the human ability to perform spatial orientation information processing, particularly when it involves the use of video display instrumentation. Spatial disorientation has consistently been the cause of numerous accidents throughout the history of flight. A study was conducted to further evaluate the Manikin Task, a complex reaction time task previously developed by the RAF as a test of spatial orientation. The objectives of the study were to (1) thoroughly evaluate the training characteristics of the task including variation in performance related to individual stimuli characteristics, (2) determine the task's speed vs. accuracy tradeoff characteristics, and (3) assess performance on the task under the influence of ethyl alcohol. Response times and accuracy were measured on five subjects under various conditions over a five-week period. Analysis of the data indicated a substantial dependence of response times on certain stimuli characteristics. In addition, there was a definite decline in accuracy corresponding to a forced decrease in response time. However, the relationship could not be adequately represented by the proposed speed-accuracy tradeoff functions. The effect of alcohol was evidenced primarily by a change in the slope if the speed-accuracy tradeoff relationship. GRA

N85-10652# Oregon Univ., Eugene. Dept. of Psychology.
INHIBITION OF RETURN: NEURAL BASIS AND FUNCTION Final Report
M. I. Posner, R. D. Rafal (Roger Williams Hospital, Providence, R.I.), L. S. Choate, and J. Vaughan (Clinton Coll., Hamilton, N.Y.) 15 Aug. 1984 48 p
(Contract N00014-83-K-0601; NR Proj. 667-523)
(AD-A145242; ONR-84-3; ONR-84-2) Avail: NTIS HC A03/MF A01 CSCL 05/10

A goal of neuropsychology is to connect cognitive functions with underlying neural systems. Posner (in press) has proposed a framework for doing so in which elementary mental operations in cognitive models are expressed in terms of component facilitations and inhibitions in the performance domain. These components are in turn linked to underlying neural systems. In the area of spatial attention one such component is the tendency to inhibit orienting toward visual locations which have been previously attended (inhibition of return). The current studies use patients and normals to demonstrate the relationship of this component to systems which generate saccades. These mid-brain systems appear to contribute specific components to the generation of programs for visual attention. The deficits found in patients and the conditions under which the inhibition is found in normals suggest that inhibition of return may function to favor foveation of information at new locations. GRA

N85-10653# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
COMPREHENSION OF INSTRUCTIONS FOR OPERATING DEVICES Technical Report, 1 Jul. 1983 - 30 Jun. 1984
K. T. Spoehr, M. E. Morris, and E. E. Smith Aug. 1984 35 p
(Contract N00014-83-C-0446; NR Proj. 154-461)
(AD-A145263; BBN-5712; TR-3) Avail: NTIS HC A03/MF A01 CSCL 05/9

Two experiments assess the processes by which written instructions for operating a piece of equipment are comprehended. Experiment 1 shows that comprehension is fastest when information on the action is to be performed, the consequences of the action, and the conditions under which it is to be performed, match the order in which it is needed to fill in a schema for executing the instruction. Experiment 2 shows that subjects use a step schema for organizing the reading process even when the material is to be read and recalled verbatim instead of being executed. Author (GRA)

N85-10606# Japanese Air Self-Defense Force, Tokyo. Aeromedical Lab.
PSYCHOLOGICAL STATES (MOOD, AFFECT OR EMOTION) EXPERIENCED BY JASDF PILOTS THROUGH FLYING DUTIES. 3: FLYING CONDITIONS CAUSING PILOTS PSYCHOLOGICAL DISTURBANCES
Miyako Okaue and Hisao Aruga *In its* The Repts. of Aeromedical Lab., Vol. 25, No. 1/2 Jun. 1984 p 1-14 refs In JAPANESE; ENGLISH summary (For primary document see N85-10605 01-51)
Avail: NTIS HC A05/MF A01

N85-10608# Japanese Air Self-Defense Force, Tokyo. Aeromedical Lab.
THE RELATIONSHIP BETWEEN EMOTIONAL TENSION SCALE AND PSYCHOLOGICAL UNEASINESS OF JASDF PILOTS IN FLYING SITUATIONS
Miyako Okaue and Hisao Aruga *In its* The Repts. of Aeromedical Lab., Vol. 25, No. 1/2 Jun. 1984 p 31-46 In JAPANESE; ENGLISH summary (For primary document see N85-10605 01-51)
Avail: NTIS HC A05/MF A01

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N85-10654 Prins Maurits Lab. TNO, Rijswijk (Netherlands).
ULTRAFILTRATION AS PRETREATMENT FOR THE PREPARATION OF DRINKING WATER BY REVERSE OSMOSIS ONBOARD SHIPS [ULTRAFILTRATIE ALS VOORBEHANDELING VOOR DE BEREIDING VAN DRINKWATER DOOR OMGEKEERDE OSMOSE AAN BOORD VAN SCHEPEN]
I. deVries and S. C. vanSwieten Dec. 1983 64 p refs In DUTCH; ENGLISH summary
(Contract A81/KM/148)
(PML-1984-32; TDCK-79376) Copyright. Avail: Issuing Activity

Reverse osmosis desalination of sea water was investigated in order to develop a low power, reliable, simple, compact and completely automated system for the preparation of drinking water onboard naval ships. Tubular, spiral wound and hollow fiber membrane configuration ultrafiltration systems were compared. Membrane surface area required to produce a constant flow as feed prior to the reverse osmosis process was studied. The three systems are suitable for pretreatment. The quality of the water guarantees an undisturbed functioning of the reverse osmosis process. Fouling of the reverse osmosis membranes by undissolved particles, including bacteria and viruses, does not occur. The tubular and spiral wound systems are the most suitable. Author (ESA)

N85-10655# Navy Clothing and Textile Research Unit, Natick, Mass.
THE EXPERIMENTAL MOD 3 FIREFIGHTERS' ALUMINIZED

CRASH-RESCUE, FIRE-PROXIMITY HOOD Final Report
H. P. Winer Jul. 1984 15 p
(AD-A144993; NCTRF-154) Avail: NTIS HC A02/MF A01 CSCL 06/17

The Navy Clothing and Textile Research Facility (NCTRF) has developed the experimental Mod III Firefighters' Aluminized Crash-Rescue Fire-Proximity Hood, which improves upon the standard firefighters' aluminized hood (MIL-H-29144). Reports from the firefighting community have indicated that the standard hood is not compatible with the current self-contained breathing apparatus. To allow for the self-contained breathing apparatus, a new aluminum frame with a greater front radius has been developed, and a liftup visor with an enlarged area for improved vision and voice communications has been incorporated in the experimental hood. This visor also reduces fogging of the face shield. Also, a bib is attached to the front to serve as a protective flap over the vacuum-deposited gold-coated facepiece when the hood is not being worn. NCTRF has conducted a service evaluation of the experimental Mod III hood. As a result of this evaluation, NCTRF recommends the adoption of the Mod III hood with a two-piece, adjustable chinstrap. GRA

N85-10656# Army Aeromedical Research Lab., Fort Rucker, Ala.
ANTHROPOMETRIC COCKPIT COMPATIBILITY ASSESSMENT OF US ARMY AIRCRAFT FOR LARGE AND SMALL PERSONNEL WEARING A TRAINING, WARM-WEATHER CLOTHING CONFIGURATION Final Report
A. W. Schopper and D. O. Cote Jul. 1984 52 p
(AD-A145208; USAARL-84-10) Avail: NTIS HC A04/MF A01 CSCL 01/3

To assess physical aviator-cockpit reach compatibilities, eight small subjects 146.9 to 162.5 cm in stature and eight tall subjects 182.3 to 194.5 cm in stature were placed in the cockpits of all current US Army helicopters (except AAH-64) and fixed-wing aircraft. Subjects were dressed in the warm weather training uniform of US Army aviators and were requested to operate all primary controls and instructor-pilot designated critical switches, knobs, etc., with the shoulder harness in the unlocked position. Helmeted head clearance also was evaluated. Among several candidate measures of upper- and lower-body reach capabilities, total arm reach (span), and crotch height, respectively, were found to be the most efficient discriminators between those who could and those who could not perform all critical operational reaches. Sitting height was employed to assess helmeted head clearance. Substantial variation was encountered in the reach-related demands for different aircraft. Minimum total arm-reach requirements throughout the fleet ranged from 147 to 168 cm; minimum crotch-height requirements ranged from 69 to 78 cm. Three aircraft could not accommodate a sitting height above 102 cm. Very large personnel experienced difficulty in achieving full lateral cyclic and stick movement in several aircraft. GRA

N85-10049*# California Univ., Davis. Dept. of Ophthalmology.
STIMULUS FACTORS IN MOTION PERCEPTION AND SPATIAL ORIENTATION
R. B. Post and C. A. Johnson *In* NASA. Dryden Flight Research Center Peripheral Vision Horizon Display (PVHD) Apr. 1984 p 57-62 refs (For primary document see N85-10044 01-06)
Avail: NTIS HC A07/MF A01 CSCL 05H

N85-10050*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE PERIPHERAL VISUAL CUE ASSESSMENT FACILITY AT AMES RESEARCH CENTER
Richard F. Haines *In* NASA. Dryden Flight Research Center Peripheral Vision Horizon Display (PVHD) Apr. 1984 p 63-70 refs (For primary document see N85-10044 01-06)
Avail: NTIS HC A07/MF A01 CSCL 05H

N85-10609# Japanese Air Self-Defense Force, Tokyo. Aeromedical Lab.
ASSESSMENT OF THE INFLATING CHARACTERISTICS OF THE MODIFIED ANTI-G SUIT
Akihiko Onozawa, Wataru Ogawa, Shoji Ogata, Masashi Oshibuchi, Mikio Ono, and Masaaki Iwane *In its* The Repts. of Aeromedical Lab., Vol. 25, No. 1/2 Jun. 1984 p 47-64 refs In JAPANESE; ENGLISH summary (For primary document see N85-10605 01-51)
Avail: NTIS HC A05/MF A01

N85-10631# Joint Publications Research Service, Arlington, Va.
TOXICOLOGICAL EVALUATION OF COLUMBIA SPACECRAFT
W. J. Rippstein and M. E. Coleman *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 4, Jul. - Aug. 1984 (JPRS-USB-84-006) 2 Oct. 1984 p 126-138 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 4, Jul. - Aug. 1984 p 87-96 (For primary document see N85-10611 01-51)
Avail: NTIS HC A07

55 PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

N85-10657*# National Aeronautics and Space Administration, Washington, D. C.
PUBLICATIONS OF THE EXOBIOLOGY PROGRAM FOR 1981: A SPECIAL BIBLIOGRAPHY
Linda G. Pleasant, comp. (George Washington Univ., Washington, D.C.) and Donald L. DeVincenzi, comp. Aug. 1984 39 p
(Contract NASw-3165)
(NASA-TM-86653; NAS 1.15:86653) Avail: NTIS HC A03/MF A01 CSCL 06C

A list of 1983 publications resulting from research pursued under the auspices of NASA's Exobiology Program is given. Topics in the fields of biological, chemical, and planetary evolution; geochemistry; and intelligent extraterrestrial life are listed. R.J.F.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

N85-10658*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A RELATIONAL APPROACH TO THE DEVELOPMENT OF EXPERT DIAGNOSTIC SYSTEMS
Kathy R. Ames Oct. 1984 68 p refs
(NASA-TM-86288; NAS 1.15:86288) Avail: NTIS HC A04/MF A01 CSCL 12A

The proposition that, given a structural and/or functional description of any real or abstract system, an expert system can be built based on this description is examined. First, a model is developed for a microprocessor-controlled end effector/sensor system using a modeling approach called a relational Knowledge-Base Machine (RKBM). Next, an explanation of how the end effector model could be used for the error diagnosis on the operational end effector is given and two versions of an error diagnosis algorithm based on the model are presented. Finally, areas of further research are described that are necessary before an expert system using this approach becomes a reality. Author

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering.*

N85-10659*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

HARDWARE FOR A REAL-TIME MULTIPROCESSOR SIMULATOR

Richard A. Blech and Dale J. Arpasi 1984 11 p refs To be presented at the SCS Multiconf. Distributed Simulation, San Diego, Calif., 24-26 Jan. 1985; sponsored by the Soc. for Computer Simulation

(NASA-TM-83805; E-2315; NAS 1.15:83805) Avail: NTIS HC A02/MF A01 CSCL 09B

The hardware for a real time multiprocessor simulator (RTMPS) developed at the NASA Lewis Research Center is described. The RTMPS is a multiple microprocessor system used to investigate the application of parallel processing concepts to real time simulation. It is designed to provide flexible data exchange paths between processors by using off the shelf microcomputer boards and minimal customized interfacing. A dedicated operator interface allows easy setup of the simulator and quick interpreting of simulation data. Simulations for the RTMPS are coded in a NASA designed real time multiprocessor language (RTMPL). This language is high level and geared to the multiprocessor environment. A real time multiprocessor operating system (RTMPOS) has also been developed that provides a user friendly operator interface. The RTMPS and supporting software are currently operational and are being evaluated at Lewis. The results of this evaluation will be used to specify the design of an optimized parallel processing system for real time simulation of dynamic systems. M.G.

N85-10660# California Univ., Los Angeles. Graduate School of Management.

ANALYSIS OF COMPUTER AND COMMUNICATION INFORMATION PROCESSING AND SYSTEM DEVELOPMENT Final Report, 1 Apr. 1982 - 31 Mar. 1983

B. P. Lientz 31 Mar. 1983 13 p

(Contract N00014-75-C-0266; RR0-1408)

(AD-A144986) Avail: NTIS HC A02/MF A01 CSCL 09/2

During this year the two major areas of research were software maintenance and information systems measurement. Previous work in maintenance was based on a centralized environment. With the increase in power and capability of microcomputers in increasing issue of interest is their use in maintenance. This is especially true when one considers that much of the maintenance effort is in a local mode without requirements for a mainframe host except for integration; testing, and reinstallation. GRA

N85-10661# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.

[ACTIVITIES OF THE MIT LABORATORY FOR COMPUTER SCIENCE] Progress Report, Jul. 1982 - Jun. 1983

Michael L. Dertouzos Jul. 1984 234 p

(Contract N00014-83-K-0125)

(AD-A145134; PR-20) Avail: NTIS HC A11/MF A01 CSCL 09/2

The work reported herein was carried out within MIT Laboratory for Computer Science during 1982-1983. This report summarizes the activities performed under DARPA funding. The contents include: Computer Systems and Communications; Computer Systems Structures; Computer Systems Joint Report; Education Computing; Functional Languages and Architectures; Information Mechanics; Programming Methodology; Programming Methodology; Programming Technology; Systematic Program Development; and Theory of Distributed Systems. GRA

N85-10662# Naval Research Lab., Washington, D. C.

DIGITAL CORRELATOR SPEED IMPROVEMENT BY MULTIPLEXING Final Report

L. M. Leibowitz 30 Sep. 1983 48 p

(AD-A145207; NRL-8750) Avail: NTIS HC A03/MF A01 CSCL 09/2

Digital correlators can detect the presence of a reference binary code within a long sequence of bits. Correlation is an essential in proposed spread spectrum applications to future target identification interrogation/reply systems. High rate pseudorandom binary codes can be used to achieve transmission security and resistance to interference and jamming by spreading transmission bandwidth. Digital correlation provides reliability and cost benefits through the use of modern digital integration techniques but has been limited in speed. Several approaches to time division multiplexing of digital correlator devices, whereby k operations are overlapped in time, are developed in this report. Where synchronization with the input signal exists, the resulting multiplexed correlators provide k-times speed improvement over individual correlator devices. A completely synchronized correlator can be formed from k such multiplexed correlators by proper selection of outputs. A simplified realization is presented that only requires one set of k N/k-bit signal and reference registers and k sets of N-bit comparator circuits. Laboratory experimentation and computer simulations to support these concepts are described. Author (GRA)

N85-10663# Argonne National Lab., Ill.

EVALUATING A SCIENTIFIC WORKSTATION COMPUTER

Richard C. Raffenetti 1984 10 p Presented at the Association for Energy Systems, Operations and Programming AESOP 25th Conf., Seattle, 3 May 1984

(Contract W-31-109-eng-38)

(DE84-014764; CONF-8404152-2) Avail: NTIS HC A02/MF A01

A scientific workstation was evaluated and user requirements of the equipment were examined. B.G.

N85-10664# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.

DATA FLOW COMPUTER ARCHITECTURE

1 Jun. 1984 5 p

(Contract DE-AC02-79ER-10473)

(DE84-014362; DOE/ER-10473/T3) Avail: NTIS HC A02/MF A01

This is a report on work on the design of a processing cluster for a high-performance data flow computer, continued work on algorithms for compiling programs from the Val programming language. Study of design methodologies for use in developing specifications of hardware components for a prototype machine, and specification of trial device designs for the custom circuits needed to construct high-performance data flow computers. DOE

N85-10665# Los Alamos Scientific Lab., N. Mex.

REMOTE: MODEM COMMUNICATOR PROGRAM FOR THE IBM PERSONAL COMPUTER

F. McGirt Jun. 1984 19 p refs

(Contract W-7405-eng-36)

(DE84-015047; LA-10143-MS) Avail: NTIS HC A02/MF A01

A Modem Communicator Program called REMOTE is developed to provide full duplex serial communication with arbitrary remote computers via either dial-up telephone modems or direct lines. The latest version of REMOTE (documented in this report) is developed for the IBM Personal Computer. DOE

N85-10666# Fondazione Ugo Bordoni, Rome (Italy).

HARDWARE IMPLEMENTATION OF A SUPPORT SYSTEM FOR THE 2501 WESTERN DIGITAL LSI, COMPLETE CONTROLLER OF THE SECOND LEVEL, FIRST VERSION OF THE CCITT 25 (CAP) RECOMMENDATIONS [REALIZZAZIONE IN HARDWARE DI UN SISTEMA DI SUPPORTO ALL'LSI 2501 DELLA WESTERN DIGITAL, CONTROLLORE COMPLETO DEL LIV. 2 SECONDO LA PRIMA VERSIONE DELLE RACCOMANDAZIONI CCITT X.25 (CAP)]

Giorgio Fruscalzo, Claudio Rossi, Mario Salerno (Rome Univ.), and Paolo Talone Dec. 1982 40 p refs In ITALIAN

(FUB-60-1982) Avail: NTIS HC A03/MF A01

The implementation of a data management subsystem acting on levels one and two of the stratified architecture communication system known as open system interconnection (OSI) is described. The WD2501 is a prototype of a family of data link control chips. Interfaces, CPU, auxiliary circuits and working memories are detailed. The operation of the system is explained. Author (ESA)

N85-10667# Fondazione Ugo Bordoni, Rome (Italy).
DETERMINATION OF THE INPUT-OUTPUT CHARACTERISTICS OF TIME-INVARIANT MEMORYLESS NONLINEAR DEVICES [DETERMINAZIONE DELLA CARATTERISTICA INGRESSO-USCITA DI DISPOSITIVI NON LINEARI TEMPO INVARIANTI SENZA MEMORIA]
Odoardo Brugia, Giovanni Campanini, Salvatore Improta (FATME S.p.A.), and William Wolfowicz Jul. 1983 16 p refs In ITALIAN; ENGLISH summary
(FUB-41-1983) Avail: NTIS HC A02/MF A01

A method to determine the input-output characteristics of a permanent memoryless nonlinear device is presented. The characteristics are expressed in polynomial form and the coefficients of the polynomial terms are determined as functions of the spectral lines of the device response to a sinusoidal input. When the characteristics may be developed as MacLaurin series the precision obtained with this method is similar to that of computerized approximation methods. Author (ESA)

N85-10668# Fondazione Ugo Bordoni, Rome (Italy).
A MICROCOMPUTER AIDED MEASUREMENT EQUIPMENT FOR MONITORING PERFORMANCE IN DIGITAL RADIO RELAY SYSTEMS
Dario DiZenobio Mar. 1984 10 p refs
(FUB-4-1984) Avail: NTIS HC A02/MF A01

Error rate in high capacity digital radio links was measured in real time operation and variations of received radio frequency power were recorded by a microcomputer based radio communication controller. The controller is implemented by a twice 48 kByte high speed memory, 2 CPU and various interfaces. The system produces enough data to define performance and availability standards in digital radio links. Author (ESA)

N85-10669# Fiorello, Shaw and Associates, McLean, Va.
STANDARDS FOR COMMERCIALLY EMERGING TECHNOLOGIES: A PRELIMINARY COST-BENEFIT ASSESSMENT FOR THE OPTICAL DIGITAL DATA DISK (OD3) TECHNOLOGY FOR MASS DATA STORAGE APPLICATIONS Final Report
Marco Fiorello Apr. 1984 88 p refs
(PB84-223593; NBS/GCR-84469) Avail: NTIS HC A05/MF A01 CSCL 09B

A preliminary cost-benefit impact assessment of promulgating information processing standards for the commercially emerging Optical Digital Data Disk (OD sup) technology, as applied to machine readable information is presented. The Federal Government perspective is emphasized. The analysis includes: estimates of the market penetration of the OD sup 3 technology; basic models of how standards can affect technology innovation and diffusion; and, a preliminary assessment of the cost-benefit to the Federal Government. GRA

N85-10670# Joint Publications Research Service, Arlington, Va.
EAST EUROPE REPORT: SCIENCE AND TECHNOLOGY
8 Aug. 1984 49 p refs Transl. into ENGLISH from various East European articles
(JPRS-ESA-84-030) Avail: NTIS HC A03/MF A01

The following topics are considered: robotics, an automatic printing control device, data acquisition, an underwater television system, minicomputers, data processing software, and ecology. For individual titles, see N85-10671 through N85-10673.

N85-10671# Joint Publications Research Service, Arlington, Va.
DECENTRALIZED DATA ACQUISITION TO REMEDY EDP BOTTLENECK c82
In its East Europe Rept.: Sci. and Technol. (JPRS-ESA-84-030) 8 Aug. 1984 p 5-9 refs Transl. into ENGLISH from Radio Fernsehen Elektron. (East Berlin), v. 32, no. 1, 1983 p 8-11 (For primary document see N85-10670 01-60)
Avail: NTIS HC A03/MF A01

Efficient data acquisition has developed into one of the most important processes in modern data processing. Centralized and decentralized methods of data acquisition are presented and compared. The development of systems for automatic data acquisition in the United States is cited. R.S.F.

N85-10672# Joint Publications Research Service, Arlington, Va.
UNDERWATER TELEVISION EQUIPMENT DESCRIBED c32
Dieter Borgelt, Arno Kiekbusch, Lutz Lippman, and Volker Schwuchow *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-84-030) 8 Aug. 1984 p 10-20 refs Transl. into ENGLISH from Radio Fernsehen Electron. (East Berlin), v. 32, no. 2, 1983 p 76-79 (For primary document see N85-10670 01-60)
Avail: NTIS HC A03/MF A01

An underwater television system for general observational purposes was developed on the basis of an industrial television camera for remote observation. Such an underwater television system is required for underwater work, inspection, research, salvage, and search. The mechanical and electrical structures of the underwater camera are discussed. Circuit diagrams are provided and the filter section and plug connections are mentioned. R.S.F.

N85-10673# Joint Publications Research Service, Arlington, Va.
REMOTE DATA PROCESSING SYSTEM SOFTWARE IN HUNGARY c61
Gabor Pados and Sandor Nagy *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-84-030) 8 Aug. 1984 p 31-34 Transl. into ENGLISH from Szamitastech. (Budapest), Jun. 1984 p 11 (For primary document see N85-10670 01-60)
Avail: NTIS HC A03/MF A01

The capabilities, operation, and use of a friendly query system are discussed. Software tools which make possible the study of the operation of remote processing systems are mentioned. R.S.F.

N85-10786# Joint Publications Research Service, Arlington, Va.
MICROCOMPUTERS IN HUNGARY
Istvan Mezgar *In its* East Europe Rept.; Sci. and Technol. (JPRS-ESA-84-029) 3 Aug. 1984 p 21-29 refs Transl. into ENGLISH from Fiz. Szemle (Budapest), no. 9, 1983 p 336-341 (For primary document see N85-10783 01-70)
Avail: NTIS HC A03/MF A01

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N85-10674 Helsinki Univ. (Finland). Dept. of Mathematics.
MODEL THEORY FOR INFINITELY DEEP LANGUAGES Thesis
Maaret Karttunen and Olli Lehto, ed. Suomalainen Tiedeakatemia 1984 99 p refs
(ISSN-0355-0087; ISBN-951-41-0477-3) Copyright. Avail: Issuing Activity

Infinitely deep formulas are a generalization of the game formulas studied by Kueker and Vaught. This paper shows that the model theory of these powerful formulas permits many of the constructions known from the model theory of ordinary infinitary languages. Infinitely deep formulas define a new hierarchy N sub kappa alpha of infinitary languages where kappa and alpha represent the width and the depth of the formulas. This hierarchy gives a generalization for formerly studied languages with infinitely deep qualities, e.g., game quantifier languages, Vaught fomrulas and Aczel's pseudoformulas. The earliest suggestion of this generalization appeared in the literature where certain kind of formulas, called constituents, were considered. These finitary formulas have a natural generalization to infinity but this leads outside the ordinary infinitary languages. The words infinitely deep refer to the fact that in these languages the tree structure of the formulas may contain infinite branches. This property is illustrated. B.W.

N85-10675 Technische Univ., Munich (West Germany). Inst. fuer Informatik.
ON THE FORMAL DESCRIPTION AND DERIVATION OF

TEMPORAL PROOF RULES FOR PROGRAM PROPERTIES
F. Kroeger Mar. 1984 40 p refs
(TUM-I8405) Copyright. Avail: Issuing Activity

Modification of the linguistic and semantic temporal framework for describing programs and their properties by introducing atomic formulas alpha (action alpha is executed) and formulas at alpha (alpha is ready to execute) is suggested. The atnext operator is discussed. Formulations of basic proof rules for verification of program properties are derived from their respective purely logical counterparts. It is shown that atomic formulas can be used for specifying the flow of control and the change of values of variables in a concrete program. Author (ESA)

N85-10676 Gesellschaft fuer Mathematik und Datenverarbeitung, Bonn (West Germany). Inst. fuer Systemtechnik.
COMPARATIVE DESCRIPTIONS OF SOFTWARE QUALITY MEASURES
Hanns Hoecker (Hochschule Bremen, West Germany), Wolf D. Itzfeldt, Monika Schmidt, and Michael Timm (Cologne Univ.) Mar. 1984 146 p refs Sponsored by EEC Prepared in cooperation with National Computing Centre, Manchester, England
(GMD-Studien-81; ISBN-3-88457-057-9; ISSN-0170-8120) Copyright. Avail: Issuing Activity

Fifty software quality measures are compared. Analysability; complexity; fault; modifiability; modularity; system independence; testability; and text comprehensibility are covered. Author (ESA)

N85-10677*# Boeing Aerospace Co., Kent, Wash.
IAC USER MANUAL
Robert G. Vos, David L. Beste, and Joseph Gregg Jul. 1984 391 p refs
(Contract NAS2-25767)
(NASA-CR-175300; NAS 1.26:175300) Avail: NTIS HC A17/MF A01 CSCL 09B

The User Manual for the Integrated Analysis Capability (IAC) Level 1 system is presented. The IAC system currently supports the thermal, structures, controls and system dynamics technologies, and its development is influenced by the requirements for design/analysis of large space systems. The system has many features which make it applicable to general problems in engineering, and to management of data and software. Information includes basic IAC operation, executive commands, modules, solution paths, data organization and storage, IAC utilities, and module implementation. M.A.C.

N85-10678*# Goodyear Aerospace Corp., Akron, Ohio.
FUNCTION ALGORITHMS FOR MPP SCIENTIFIC SUBROUTINES, VOLUME 1
J. G. Gouch Feb. 1984 165 p
(Contract NAS5-27610)
(NASA-CR-175246; NAS 1.26:175246; GER-17221-Vol-1) Avail: NTIS HC A08/MF A01 CSCL 09B

Design documentation and user documentation for function algorithms for the Massively Parallel Processor (MPP) are presented. The contract specifies development of MPP assembler instructions to perform the following functions: natural logarithm; exponential (e to the x power); square root; sine; cosine; and arctangent. To fulfill the requirements of the contract, parallel array and solar implementations for these functions were developed on the PDP11/34 Program Development and Management Unit (PDMU) that is resident at the MPP testbed installation located at the NASA Goddard facility. Author

N85-10679# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
A COMBINED LOGISTIC REGRESSION AND ZIONTS-WALLENIUS METHODOLOGY FOR MULTIPLE CRITERIA LINEAR PROGRAMMING
Theodor J. Stewart Aug. 1983 25 p refs
(TWISK-314) Avail: NTIS HC A02/MF A01

The use of logistic regression to infer the values of weights in a linear utility function representing the decision maker's preferences is incorporated within an interactive method of the Zionts-Wallenius type. This provides a method with much of the simplicity and power of the Zionts-Wallenius method, and with additional robustness to deviations of preference statements from consistency with a strict linear utility function. The method also provides for making explicit use of indifference as well as preference statements. Application of the method to a small problem is discussed. M.G.

N85-10680# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
A PACKED STORAGE PROGRAM FOR ANGULAR MOMENTUM COUPLING COEFFICIENTS
C. F. Vermaak, D. Vermaak, and H. G. Miller Jul. 1983 21 p
(TWISK-316) Avail: NTIS HC A02/MF A01

In order to avoid the recalculation of angular momentum coupling coefficients required in certain types of quantum mechanical calculations, an efficient packed storage mode was devised. Structured arrays are constructed in which the storage requirements are reduced by making use of the symmetry properties of the Wigner 3-j coefficients. Rapid retrieval of a 3-j coefficient is possible without searching through the arrays. A separate return enables the user to obtain the appropriate Clebsch-Gordan coefficient. Author

N85-10681# National Inst. for Transport and Road Research, Pretoria (South Africa). Computer Information Centre for Transportation.
THREE PROGRAMS FOR EVALUATING BENDING MOMENTS, DEFLECTIONS AND SHEAR FORCES IN SIMPLY-SUPPORTED UNIFORM BRIDGE DECKS UNDER SOUTH AFRICAN NA LOADING: NAB, NAD AND NAS. NITRR MANUAL P13
1983 27 p
(ISBN-0-7988-2283-X) Avail: NTIS HC A03/MF A01

Computer programs are used to simulate loads on a simply supported bridge deck. The programs evaluate midspan bending moment, midspan deflection for uniform decks and shear force at any point. The loading pattern are printed. M.A.C.

N85-10682*# Intermetrics, Inc., Huntsville, Ala.
PDSS/IMC CIS USER'S GUIDE
30 Oct. 1984 110 p
(Contract NAS8-33825)
(NASA-CR-171179; NAS 1.26:171179; IR-AL-031) Avail: NTIS HC A06/MF A01 CSCL 09B

The Spacelab Payload Development Support System PDSS Image Motion Compensator (IMC) computer interface simulation (CIS) user's manual is given. The software provides a real time interface simulation for the following IMC subsystems: the Dry Rotor Reference Unit, the Advanced Star/Target Reference Optical sensor, the Ultra Violet imaging telescope, the Wisconson Ultraviolet Photopolarimetry Experiment, the Cruciform Power distributor, and the Spacelab Experiment Computer Operating System. R.J.F.

N85-10683*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FLOATING-POINT FUNCTION GENERATION ROUTINES FOR 16-BIT MICROCOMPUTERS
Michael A. Mackin and James F. Soeder Oct. 1984 55 p refs
(NASA-TM-83783; E-2279; NAS 1.15:83783) Avail: NTIS HC A04/MF A01 CSCL 09B

Several computer subroutines have been developed that interpolate three types of nonanalytic functions: univariate, bivariate, and map. The routines use data in floating-point form. However, because they are written for use on a 16-bit Intel 8086 system with an 8087 mathematical coprocessor, they execute as fast as routines using data in scaled integer form. Although all of the routines are written in assembly language, they have been implemented in a modular fashion so as to facilitate their use with high-level languages. Author

N85-10684*# Naval Postgraduate School, Monterey, Calif.
ADS: A FORTRAN PROGRAM FOR AUTOMATED DESIGN

SYNTHESIS, VERSION 1.00 Final Report
G. N. Vanderplaats Hampton, Va. NASA. Langley Research Center Oct. 1984 44 p refs
(NASA Order L-9461-B)
(NASA-CR-172460; NAS 1.26:172460) Avail: NTIS HC A03/MF A01 CSCL 09B

A new general-purpose optimization program for engineering design is described. ADS-1 (Automated Design Synthesis - Version 1) is a FORTRAN program for solution of nonlinear constrained optimization problems. The program is segmented into three levels, being strategy, optimizer, and one-dimensional search. At each level, several options are available so that a total of over 100 possible combinations can be created. Examples of available strategies are sequential unconstrained minimization, the Augmented Lagrange Multiplier method, and Sequential Linear Programming. Available optimizers include variable metric methods and the Method of Feasible Directions as examples and one-dimensional search options include polynomial interpolation and the Golden Section method as examples. Emphasis is placed on ease of use of the program. All information is transferred via a single parameter list. Default values are provided for all internal program parameters such as convergence criteria, and the user is given a simple means to over-ride these, if desired. The program is demonstrated with a simple structural design example. Author

N85-10685*# Illinois Univ., Urbana. Dept of Computer Science.
SAGA: A PROJECT TO AUTOMATE THE MANAGEMENT OF SOFTWARE PRODUCTION SYSTEMS Progress Report, Jan. - Jun. 1984
Roy H. Campbell, Wayne Badger, Carol S. Beckman, George Beshers, David Hammerslag, John Kimball, Peter A. Kirslis, Hal Render, Paul Richards, and Robert Terwilliger 1984 15 p
(Grant NAG1-138)
(NASA-CR-174017; NAS 1.26:174017) Avail: NTIS HC A02/MF A01 CSCL 09B

The project to automate the management of software production systems is described. The SAGA system is a software environment that is designed to support most of the software development activities that occur in a software lifecycle. The system can be configured to support specific software development applications using given programming languages, tools, and methodologies. Meta-tools are provided to ease configuration. Several major components of the SAGA system are completed to prototype form. The construction methods are described. M.A.C.

N85-10686# Softech, Inc., Waltham, Mass.
Ada (TRADEMARK) TRAINING CURRICULUM. USING THE Ada LANGUAGE REFERENCE MANUAL L402 TEACHER'S GUIDE
Jul. 1984 294 p
(Contract DAAB07-83-C-K514)
(AD-A143582) Avail: NTIS HC A13/MF A01 CSCL 09/2

A curricular for the Ada programming language is given. Exercises to be completed by trainees are given. R.J.F.

N85-10687# Softech, Inc., Waltham, Mass.
Ada (TRADEMARK) TRAINING CURRICULUM. BASIC Ada PROGRAMMING L202 TEACHER'S GUIDE. LABORATORY MANUAL AND EXERCISES
May 1984 160 p
(Contract DAAB07-83-C-K514)
(AD-A143583) Avail: NTIS HC A08/MF A01 CSCL 05/9

This Manual contains Tutorials for the VAX/VMS, VAX/VMS EDT editor, and New York University's Ada/ED Translator/Interpreter which the class will be using. This manual contains exercises to be completed during the laboratory sessions. GRA

N85-10688# Wisconsin Univ., Madison. Mathematics Research Center.
MICROSCOPE: A SOFTWARE SYSTEM FOR MULTIVARIATE ANALYSIS Technical Summary Report
P. Alfeld and B. Harris Jun. 1984 123 p
(Contracts DAAG29-80-C-0041; DE-AC02-82ER-12046)
(AD-A144720; MRC-TSR-2701) Avail: NTIS HC A06/MF A01 CSCL 09/2

In Computer Aided Geometric Design and other applications of Multivariate Interpolation and Approximation it is often necessary to build complicated computational procedures. These should have certain properties according to the mathematical theory, but the construction may have failed due to oversights or simple programming errors. This report describes an interactive portable FORTRAN software system, MICROSCOPE, that allows the following questions, among others, to be answered: Given an approximation or interpolation scheme, does the scheme interpolate? How often is the approximant differentiable? What functions does it reproduce exactly? The system also allows the identification of bugs in a FORTRAN implementation of an approximation scheme, often pinpointing the faulty portion of the code within narrow limits. MICROSCOPE is also useful in the corroboration of theoretical results, in guiding a theoretical analysis, and for classroom use. In addition to documenting the program package, this manual also contains a thorough discussion of numerical differentiation. GRA

N85-10689# Softech, Inc., Waltham, Mass.
INTEGRATED COMPUTER-AIDED MANUFACTURING (ICAM) ARCHITECTURE. PART 3, VOLUME 8: TECHNOLOGY TRANSFER Final Report, Sep. 1980 - Oct. 1982
A. W. Snodgrass Wright-Patterson AFB, Ohio AFWAL Sep. 1983 520 p
(Contract F33615-80-C-5109)
(AD-A144732; Rept-1080-37; AFWAL-TR-82-4063-Pt-3-Vol-8) Avail: NTIS HC A22/MF A01 CSCL 13/8

The Integrated Computer Aided Manufacturing (ICAM) Architecture Part III was initiated to maintain and update the existing manufacturing architecture as well as develop training courses to assist in the transition of IDEF applications, concepts and procedures to other Air force programs. This volume presents the three courses designed to transfer IDEF concepts and techniques to other ICAM Programs. This technology transfer material provides an executive overview of ICAM and Technology Modernization (TechMod) techniques and benefits and, separately, course material for teaching the IDEF methodology. For each of these two subjects, a presentation manual and a train the trainers manual is provided. The presentation manuals include guidance for: setup, pre-presentation activities, presentation, and post-presentation activities. These manuals also include hard copies of the actual slides used in the presentation. The train the trainers manuals repeat the material of the presentation manuals, but add an instructional objective and a suggested narration for each slide. GRA

N85-10690# Naval Postgraduate School, Monterey, Calif.
NORMAL APPROXIMATION FOR RESPONSE TIME IN A PROCESSOR-SHARED COMPUTER SYSTEM MODEL M.S. Thesis
S. Pornsuriya Mar. 1984 107 p
(AD-A144997; AD-E301454) Avail: NTIS HC A06/MF A01 CSCL 09/2

In a time-shared computer system, the processor allocates its processing time equally to all jobs submitted for service from a fixed number of terminals. Under Markov assumptions, i.e., independent identically distributed exponential terminal think times and job requested service times, the distribution of response time of a tagged job theoretically can be determined by solving a system of differential equations derived for each initial system state. However, explicit closed form solutions to these equations are quite complex. The Central Limit Theorem and heavy traffic arguments suggest normal approximations to the distribution of the response time. Simulation of the response time is used to study the accuracy of these normal approximations to the response time distribution via moments and quantiles. Finally, the analysis is extended to a model for a system with two types of terminals. Author (GRA)

N85-10691# Orlando Technology, Inc., Shalimar, Fla.
HULL USERS' MANUAL Final Report, Sep. 1982 - Sep. 1983
D. A. Matuska Jun. 1984 106 p
(Contract F08635-81-C-0131)
(AD-A145000; AD-E800994; AFATL-TR-84-59) Avail: NTIS HC A06/MF A01 CSCL 09/2

This report outlines the structures and input syntax for using the HULL finite difference hydrodynamics code. The HULL solves the partial differential equations descriptive of an inviscid, nonconducting continuous hydrodynamic/elastic/plastic medium subjected to dynamic loading. GRA

N85-10692# Ballistic Research Labs., Aberdeen Proving Ground, Md.
COM-GEOM INTERACTIVE DISPLAY DEBUGGER (CIDD) Final Report
G. G. Kuehl Aug. 1984 42 p
(AD-A145001; AD-F300456; ARBRL-TR-02574) Avail: NTIS HC A03/MF A01 CSCL 12/1

To speed the process of debugging combinatorial geometry (COM-GEOM) target description data used in the geometric information for targets (GIFT) computer code, a program was written to interactively display the geometric figures called solids and their combinations called regions on a desk top graphics terminal. GRA

N85-10693# Massachusetts Inst. of Tech., Cambridge. Statistics Center.
NUMERICAL ALGORITHMS AND PARALLEL TASKING Interim Report, 15 May 1983 - 14 May 1984
V. Klema Jul. 1984 5 p
(Grant AF-AFOSR-0210-82)
(AD-A145090; AFOSR-84-0744TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

During this research period progress was made on the system integration of the software tasker to support algorithmic and applications segmentation for concurrent computing. This permits an efficient distribution of code and data on processing elements. The tasker provides primitives to support the segmenting of processes, monitors execution on worker processors by the manager on each concurrent system, and achieves asynchronous communication among worker processors and between the manager processor and the workers. Author (GRA)

N85-10694# Softech, Inc., Waltham, Mass.
Ada (TRADEMARK) TRAINING CURRICULUM. REAL-TIME CONCEPTS L303 TEACHER'S GUIDE
Jul. 1984 228 p
(Contract DAAB07-83-C-K514)
(AD-A145093) Avail: NTIS HC A11/MF A01 CSCL 09/2

Ths Ada training curriculum outlines the following points: Concurrent programming concepts; Ada tasking features; Fundamental Task Designs; and Improving Performance. B.W.

N85-10695# Softech, Inc., Waltham, Mass.
Ada (TRADEMARK) TRAINING CURRICULUM. SOFTWARE ENGINEERING FOR MANAGERS M101 TEACHER'S EXERCISE GUIDE
May 1984 24 p
(Contract DAAB07-83-C-K514)
(AD-A145094) Avail: NTIS HC A02/MF A01 CSCL 05/9

The instructor's guide is designed to illustrate the use of the engineering goals and principles that we have been discussing. The class is split into four groups: Three with specific goals stated in the exercise, a fourth with no explicit goals. Each of the three groups has a different goal as follows: (1) The user must never fail to build the object, using the documentation (Reliability); (2) The user must build the object within one minute, using the documentation (Performance); (3) Once built, the user must be able to tear down and store the pieces, so the object can be rebuilt later (Maintainability). GRA

N85-10696# Naval Surface Weapons Center, Dahlgren, Va.
THLL (TRIDENT HIGHER LEVEL LANGUAGE) REFERENCE MANUAL Final Report
H. G. Huber Jul. 1984 206 p
(AD-A145116; NSWC/TR-84-101) Avail: NTIS HC A10/MF A01 CSCL 09/2

The TRIDENT Higher Level Language (THLL) is a procedure-oriented, block-structured programming language used for writing operational software for the TRIDENT Digital Control Computer and the MC68000 as well as support software for the VAX 11/780. This Technical Report serves as a complete reference manual for THLL. Target machine dependencies are, in general, explained in this document for each of the three target machines. The runtime support and target machine unique features are documented in References 1, 2, and 3. Author (GRA)

N85-10697# California Univ., Berkeley.
ASSESSING THE RELIABILITY OF COMPUTER SOFTWARE AND COMPUTING NETWORKS: AN OPPORTUNITY FOR PARTNERSHIP WITH COMPUTER SCIENTISTS
R. E. Barlow and N. D. Singpurwalla (George Washington Univ., Washington, D.C.) Jul. 1984 11 p
(Contracts N00014-77-C-0263; N00019-83-C-0358; Grant AF-AFOSR-0122-81)
(AD-A145131; ORC-84-7; AFOSR-84-0821TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

This paper highlights three areas which are of importance in computer science, and in which statisticians can make valuable contributions. The authors outline these areas, survey the developments, and point out some of the open problems. The research areas are: software reliability, the reliability of fault tolerant computers, and the reliability of computer networks. GRA

N85-10698# Sandia Labs., Albuquerque, N. Mex.
RSCORS GRAPHICS SYSTEM
Gloria C. Padilla and Samuel L. Thompson Jan. 1984 192 p refs
(Contract DE-AC04-76DP-00789)
(DE84-015693; SAND-83-2639) Avail: NTIS HC A09/MF A01

RSCORS is a powerful computer graphics system in the form of a user-callable FORTRAN library. The system is flexible, portable and nonproprietary. Routines are available for both two- and three-dimensional projections, black/white and color applications, contours and many other general situations. The system is currently available for CRAY, DCD, and VAX computers. Version 2.0 is described. DOE

N85-10699# Sandia Labs., Albuquerque, N. Mex.
AGS-880 MENU SYSTEM USER GUIDE
Gregory L. Neugebauer Jun. 1984 122 p
(Contract DE-AC04-76DP-00789)
(DE84-014338; SAND-82-1543-Rev) Avail: NTIS HC A06/MF A01

This document describes the AGS-880 Menu System. It uses a mylar menu overlay on the DADS terminal tablet which allows the user a more effective use of the system by providing a means to execute specific system commands or series of linked system commands. DOE

N85-10700# Sandia Labs., Albuquerque, N. Mex.
HALFSPACE REPRESENTATIONS OF EXTRUSIONS, SOLIDS OF REVOLUTION AND PYRAMIDS
D. P. Peterson Jul. 1984 51 p refs
(Contract DE-AC04-76DP-00789)
(DE84-015005; SAND-84-0572) Avail: NTIS HC A04/MF A01

The region bounded by an arbitrary polygon of n sides may be represented by a binary tree with n leaves, each of which is a planar halfspace that is associated with a side of the polygon, whose interior nodes are either regularized set intersections or unions. This representation is used to obtain binary tree representations for extrusions, solids of revolution, and pyramids. DOE

N85-10701# Argonne National Lab., Ill.
MATHMATICS AND COMPUTER SCIENCE DIVISION ACTIVITIES Technical Report, 1 Apr. 1983 - 31 Mar. 1984
G. W. Pieper, ed. 1984 46 p refs
(Contract W-31-109-eng-38)
(DE84-014842; ANL-84-32) Avail: NTIS HC A03/MF A01

The research activities in the Mathematics and Computer Science Division at Argonne National Laboratory for the period April 1, 1983 through March 31, 1984 are discussed. Various projects carried out in four major areas of research: applied analysis, computational mathematics, software engineering, and advanced scientific computing are discussed. The research computing facility is also briefly described. Information on section staff, visitors, workshops, and seminars is given. DOE

N85-10702# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
ESTABLISHING A SOFTWARE ENGINEERING TECHNOLOGY (SET)
Jun. 1983 108 p
(PB84-212141; OSD/FSTC-83/014) Avail: NTIS HC A06/MF A01 CSCL 09B

An approach for establishing and implementing procedures for managing a software engineering program based upon software life cycles is defined. It provides the direction and structure upon which a detailed plan for managing and control of software by establishing and institutionalizing a software engineering technology (SET) for replacing manual tasks with automated procedures. The SET includes the development of software standards, quality assurance, training along with the acquisition and utilization of software tools and the integration of these elements into a suitable productive machine environment. GRA

N85-10703# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
FSTC (FEDERAL SOFTWARE TESTING CENTER) SOFTWARE TOOL CATALOG
Mar. 1984 60 p
(PB84-212158; OIT/FSTC-84/021) Avail: NTIS HC A04/MF A01 CSCL 09B

The Federal Software Testing Center (FSTC) is making software tools available to Federal and State Government agencies (lease basis) for reducing the cost of the development and maintenance of computer software. Software tools are specifically designed computer programs used to increase programmer productivity. Software tools can be used to automate tasks that, when performed manually, are repetitive, boring and prone to error. These software tools have been acquired by the Center and are extensively tested before release. The Center will provide periodic maintenance and enhancement to these software tools. GRA

N85-10704# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
MICROCOMPUTER MANAGEMENT GUIDELINES
Nov. 1983 77 p refs
(PB84-212174; OIT/FSTC-83/019) Avail: NTIS HC A05/MF A01 CSCL 09B

The microcomputer management guidelines describe the many steps involved in the selection, acquisition, and management of microcomputers. Microcomputing is rapidly proliferating throughout government organizations. In many agencies, comprehensive policy on microcomputing has not yet been formulated. The technology changes almost daily and new users are eager to capitalize on the many benefits available from microcomputing. With the large number of possible system configurations available in the marketplace, users, anxious to acquire microcomputers, may configure systems having a high degree of incompatibility with other agency systems. The source of the problem can be either hardware, software, or a combination of the two. GRA

N85-10705# Computer Corp. of America, Cambridge, Mass.
LOGICAL DATABASE PROCESSOR INTERFACE SPECIFICATIONS Final Report
Frank Manola Mar. 1984 93 p refs
(Contract NB79-SBCA-0086)
(PB84-216456; CCA-83-11; NBS-GCR-84-461) Avail: NTIS HC A05/MF A01 CSCL 09B

The interface specifications and processing functions of the logical Data Base Processor (LDBP) component of a data base management system (DBMS) component architecture developed by Computer Corporation of America for the National Bureau of Standards are described. The component architecture is intended to serve as a potential framework for developing DBMS standards. The LDBP component serves to implement the DBMS logical data model, and provides access to DBMS metadata for all components. The LDBP interface provides a common target for the development of DBMS user language facilities. GRA

N85-10706# Software Systems Technologies, Inc., College Park, Md.
ANALYSIS OF THREE DATABASE SYSTEM ARCHITECTURES USING BENCHMARKS Final Report
S. Bing Yao, Alan R. Hevner, Steven Baur, Randy Berkow, Ruth Hildenberger, and Shao Ti Yu 9 May 1984 182 p refs
(Contract NB82-SBCA-1645)
(PB84-217512; NBS-GCR-84-468) Avail: NTIS HC A09/MF A01 CSCL 09B

This report tests a newly designed benchmaking methodology (see related document), which evaluates the performance of database management systems, by applying it to three different database systems representative of current microcomputer, minicomputer, and database machine architectures. These experiments serve to demonstrate the viability of the methodology, and provide performance measures which characterize today's relational database systems under these environments. Finally, this report reaches conclusions, based upon the results of the benchmark experiments, which span the three architectural classes. Observations are made about the performane of each type of system architecture, rather than comparing three commercial database systems. GRA

N85-10707# Software Systems Technologies, Inc., College Park, Md.
PERFORMANCE EVALUATION OF DATABASE SYSTEMS: A BENCHMARK METHODOLOGY Final Report
S. Bing Yao, Alan R. Hevner, and Tom Romeo May 1984 46 p refs
(Contract NB82-SBCA-1645)
(PB84-217504; NBS/GCR-84/467) Avail: NTIS HC A03/MF A01 CSCL 09B

A generalized performance analysis methodology for the benchmarking of database systems is presented. This methodology discusses criterial to be used in the design, execution, and analysis of a database system benchmark. This is a generalized methodology that can apply to any possible database system. By presenting a wide variety of possible considerations in the design and implementation of the benchmark, it is intended to make this methodology applicable to the evaluation, or to the comparison of several systems. GRA

N85-10708# National Bureau of Standards, Washington, D.C. Statistical Engineering Div.
DATAPLOT: INTRODUCTION AND OVERVIEW
James J. Filliben Jun. 1984 117 p
(PB84-214055; NBS/SP-667; NBS/DF-84/003B) Avail: NTIS HC A06/MF A01 CSCL 09B

DATAPLOT, a high-level (free format English like syntax) language for graphics (continuous or discrete), fitting (linear or non-linear), general data analysis and mathematics is described. The analyst is given a broad overview of the structure, capabilities, and features of the DATAPLOT language. The features and capabilities described are for version 84/7 of DATAPLOT. Most (but not all) descriptions also hole for prior versions. GRA

N85-10709# National Bureau of Standards, Washington, D.C. Center for Building Technology.

A MODULAR DATA ACQUISITION AND DISPLAY SOFTWARE SYSTEM FOR A LABORATORY ENVIRONMENT Final Report
Lawrence Kaetzel, John Grimes, and Paul Brown May 1984 63 p Sponsored in part by DOE
(PB84-217692; NBS/TN-1188) Avail: NTIS HC A04/MF A01; also available SOD CSCL 09B

The processes involved in acquiring and analyzing experimental laboratory data using a medium sized computer in a multiprogramming environment with a modular software system is described. Research involving phase change materials and calorimetric performance measurements in building research are used as case studies to describe the functional capabilities and operational procedures of the system. The software system consists of computer programs which allow the researcher to collect, store, and analyze data graphically. GRA

N85-10383*# Maryland Univ., College Park. Inst. for Physical Science and Technology.
PERFORMANCE OF THE h, p AND h-p VERSIONS
I. Babuska, W. Gui, and B. Szabo (Washington Univ., St. Louis) *In* NASA. Langley Research Center Res. in Struct. and Dyn., 1984 Oct. 1984 p 73-93 refs (For primary document see N85-10377 01-39)
(Contracts N00014-77-C-9623; N00014-81-K-0625; Grant NSF DMS-83-15216)
Avail: NTIS HC A18/MF A01 CSCL 09B

N85-10387*# Colorado Univ., Boulder. Dept. of Civil Engineering.
INTERACTIVE GRAPHICS NONLINEAR CONSTRAINED OPTIMIZATION
Victor E. Saouma and Efthimios S. Sikiotis *In* NASA. Langley Research Center Res. in Struct. and Dyn., 1984 Oct. 1984 p 143-157 refs (For primary document see N85-10377 01-39)
(Grant NSF CEE-84-05621)
Avail: NTIS HC A18/MF A01 CSCL 09B

N85-10404*# Bennett Computational Mechanics, Pleasant Hill, Calif.
ON THE COMPUTER ANALYSIS OF STRUCTURES AND MECHANICAL SYSTEMS
Bruce E. Bennett *In* NASA. Langley Research Center Res. in Struct. and Dyn., 1984 Oct. 1984 p 405-422 refs (For primary document see N85-10377 01-39)
Avail: NTIS HC A18/MF A01 CSCL 09B

N85-10614# Joint Publications Research Service, Arlington, Va.
POTENTIAL USE OF DIALOGUE WITH COMPUTERS IN BIOMEDICAL RESEARCH
T. M. Smirnova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 18, No. 4, Jul. - Aug. 1984 (JPRS-USB-84-006) 2 Oct. 1984 p 18-22 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 4, Jul. - Aug. 1984 p 16-19 (For primary document see N85-10611 01-51)
Avail: NTIS HC A07

N85-10673# Joint Publications Research Service, Arlington, Va.
REMOTE DATA PROCESSING SYSTEM SOFTWARE IN HUNGARY
Gabor Pados and Sandor Nagy *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-84-030) 8 Aug. 1984 p 31-34 Transl. into ENGLISH from Szamitastech. (Budapest), Jun. 1984 p 11 (For primary document see N85-10670 01-60)
Avail: NTIS HC A03/MF A01

N85-10785# Joint Publications Research Service, Arlington, Va.
METHODS, APPLICATIONS OF IMAGE PROCESSING
Miklos Hajal *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-84-029) 3 Aug. 1984 p 16-20 Transl. into ENGLISH from Szamitastech. (Budapest), no. 10, 1983 p 6-7 (For primary document see N85-10783 01-70)
Avail: NTIS HC A03/MF A01

62 COMPUTER SYSTEMS

Includes computer networks.

N85-10710*# Old Dominion Univ., Norfolk, Va. Dept. of Geology.
FIELD TESTS OF THE REAL-DATA ACQUISITON SYSTEM FOR THE NASA-LaRC DIFFERENTIAL ABSORPTION LIDAR Progress Report, 1 Jan. - 31 Jun. 1984
Carolyn Butler Sep. 1984 4 p
(Grant NCC1-28)
(NASA-CR-174020; NAS 1.26:174020; GSTR-84-12) Avail: NTIS HC A02/MF A01 CSCL 09B

A data acquisition system (DAS) for the NASA/LaRC Differential Absorption Lidar (DIAL) was documented. This DAS is a dual LSI 11/23 set up where one computer retrieves data from the digitizers and other peripheral units, stores that data on magnetic tape, generates aerosol grayscales on a Trilog printer and passes data to the second computer. The second computer is dedicated to real time displays of the data in a variety of modes from raw data to range resolved ozone profiles. The DIAL DAS also has several new features. Author

N85-10711*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
COMMUNICATIONS PROTOCOLS FOR A FAULT TOLERANT, INTEGRATED LOCAL AREA NETWORK FOR SPACE STATION APPLICATIONS
Barry D. Meredith Sep. 1984 51 p refs
(NASA-TM-86304; NAS 1.15:86304) Avail: NTIS HC A04/MF A01 CSCL 09B

The evolutionary growth of the Space Station and the diverse activities onboard are expected to require a hierarchy of integrated, local area networks capable of supporting data, voice and video communications. In addition, fault tolerant network operation is necessary to protect communications between critical systems attached to the net and to relieve the valuable human resources onboard Space Station of day-to-day data system repair tasks. An experimental, local area network is being developed which will serve as a testbed for investigating candidate algorithms and technologies for a fault tolerant, integrated network. The establishment of a set of rules or protocols which govern communications on the net is essential to obtain orderly and reliable operation. A hierarchy of protocols for the experimental network is presented and procedures for data and control communications are described. Author

N85-10712# California Univ., Livermore. Lawrence Livermore Lab.
STORAGE IN THE LLNL OCTOPUS NETWORK: AN OVERVIEW AND REFLECTIONS
S. Coleman and R. Watson 28 Feb. 1984 7 p refs Presented at 6th IEEE Symp. on Mass Storage Systems, Vail, Colo., 4 Jun. 1984
(Contract W-7405-eng-48)
(DE84-014711; UCRL-90477; CONF-840685-2) Avail: NTIS HC A02/MF A01

The paper reviews the environment and characteristics of the central storage system at the Lawrence Livermore National Laboratory Computation Center. It then discusses some lessons learned from the successes and problems during 15 years of experience with this system and finally indicates some future directions. DOE

N85-10713# Fondazione Ugo Bordoni, Rome (Italy).
THROUGHPUT CHARACTERISTICS OF CARRIER SENSE MULTIPLE ACCESS (CSMA) NETWORKS
Marco Listanti, Achille Pattavina (Rome Univ.), and Aldo Roveri (Rome Univ.) Nov. 1983 22 p refs
(FUB-25-1983) Avail: NTIS HC A02/MF A01

The throughput of bus multiaccess networks employing CSMA or CSMA collision detection protocols is evaluated. Nonpersistent, 1-persistent and p-persistent subclasses of both protocols are

considered. The analytical model is based on Markov chains. The access procedures exploited by the protocols, the adopted model and the protocol performance evaluation are discussed. Compared with the I-persistent protocol, the nonpersistent one shows a worse performance at low offered traffic, while for high values it has a better performance since collisions are limited to multiple births in single slot. Author (ESA)

N85-10714# Fondazione Ugo Bordoni, Rome (Italy).
END-TO-END PERFORMANCE IN LOCAL AREA NETWORKS OF INTERCONNECTED TOKEN RINGS
Werner Bux and Davide Grillo (IBM Research Laboratory, Zurich) Nov. 1983 12 p refs Presented at IEEE INFOCOM 84, San Francisco, 9-12 Apr. 1984
(FUB-42-1983) Avail: NTIS HC A02/MF A01

The performance characteristics of local-area networks consisting of multiple token rings interconnected through bridges are studied. Bridges are not involved in flow or error control. Such functions are provided end-to-end between the communicating stations. In case of congestion, bridges discard frames. Such frames are recovered through the end-to-end protocols at the logical link control level. The performance analysis includes the effects of window size, backbone speed, ring access priority for bridges and bridge buffer size. Author (ESA)

N85-10715# National Bureau of Standards, Washington, D.C. Systems and Network Architecture Div.
PROCEEDINGS OF THE 5TH LAN-TRANSPORT WORKSHOP
Michael A. Wallace Mar. 1984 34 p Workshop held 8-9 Mar. 1984
(PB84-232667; NBSIR-84-2855) Avail: NTIS HC A03/MF A01 CSCL 09B

The File Transfer Protocol (FTP) testing schedule and minimum vendors tests was defined at the workshop. Minor adjustments were made to the FTP and agreements were reached on participation in the Honeywell Information Systems and Boeing Computer Service a demonstrations. All vendor agreed to implement the FCOPY utility and supply disk space so that they can participate in the FTP demonstrations. Refinements to the FTP were approved and transport protocol testing experiences were covered. E.R.

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N85-10716# Department of Energy, Washington, D. C.
AUTOMATED APPARATUS FOR PRODUCING GRADIENT GELS Patent Application
Norman L. Anderson, inventor (to DOE) Filed 10 Nov. 1983 11 p
(Contract W-31-109-eng-38)
(DE84-014507; US-Patent-Appl-SN-550429) Avail: NTIS HC A02/MF A01

Apparatus for producing a gradient gel which serves as a standard medium for a two dimensional analysis of proteins are described. The gel has a density gradient along its height formed by a variation in gel composition, with the apparatus including first and second pumping. Each includes a plurality of pumps on a common shaft and are driven by a stepping motor capable of providing small incremental changes in pump outputs for the gel ingredients, the motors being controlled by digital signals from a digital computer. A hollow form or cassette for receiving the gel composition; means for transferring the gel composition, including a filler tube extending near the bottom of the cassette; adjustable horizontal and vertical arms for automatically removing and relocating the filler tube in the next cassette; and a digital computer programmed to automatically control the stepping motors, arm movements, and associated sensing operations involving the filling operation are discussed. DOE

N85-10717# Mathematisch Centrum, Amsterdam (Netherlands).
MARKOVIAN CONTROL PROBLEMS: FUNCTIONAL EQUATIONS AND ALGORITHMS Ph.D. Thesis
A. Federgruen 1983 230 p refs
(MCTH-97) Avail: NTIS HC A11/MF A01

Value iteration in finite Markov problems; contraction mappings underlying undiscounted Markov decision problems; nonstationary Markov decision problems with converging parameters; successive approximation methods for solving nested functional equations in Markov decision theory; the optimality equation in average cost denumerable state semiMarkov decision problems recurrence conditions and algorithms are discussed. Stochastic games with n persons; functional equations in undiscounted and sensitive discounted stochastic games; and successive approximation methods in two person, zero sum stochastic games are considered. Author (ESA)

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N85-10718 Forschungsinstitut fuer Hochfrequenzphysik, Werthoven (West Germany).
RECURSIVE ALGORITHMS FOR ADAPTIVE ARRAYS BASED ON ESTIMATES
J. Worms Apr. 1984 37 p refs In GERMAN; ENGLISH summary
(Contract BMVg-RuS-T/RF31/71435/71340)
(Rept-5-84; Lfd-224) Copyright. Avail: Issuing Activity

A general recursive formula for the solution of the Wiener filter by partly adaptive arrays was developed. Simulations for the stationary and nonstationary case, and a modification of the algorithm in the case of steady state are presented. Author (ESA)

N85-10719# Division of Mechanical Engineering, Ottawa (Ontario).
A GENERALIZED MATHEMATICAL SOLUATION FOR TRANSIENT OFF TRACKING OF SINGLE VEHICLES AND TRUCK COMBINATIONS
J. H. F. Woodrooffe, L. E. Morisset, and C. A. M. Smith 1983 96 p refs
(DM-2; NCR-22878; NRCC-1983/11) Avail: NTIS HC A05/MF A01

A simplified mathematical solution to predict transient off tracking of multiple vehicle combinations is presented. The generalized equations assume a constant radius curve of any angular duration with a tangent lead in and run out. The validated solution yields the off tracking of a vehicle or vehicle combination with respect to a track mounted observer. The equations are of continuous piecewise form and are field solvable. Author

N85-10720# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
APPROXIMATING HIERARCHICAL NORMAL PRIORS USING A VAGUE COMPONENT
Yoel Haitovsky (Hebrew Univ., Jerusalem) and James V. Ziedk (University of British Columbia) Mar. 1983 29 p refs
(CSIR-TWISK-284) Avail: NTIS HC A03/MF A01

Hierarchical prior distributions and the effect of replacing the distribution of a component in the hierarchy with a diffuse distribution are examined. The analysis is carried out for the case where the sampling and prior distributions are multivariate normal because in this case explicit answers are obtainable. The prior distribution of the parameter, theta (sub 1), of interest involves a hierarchy of hyperparameters, theta (sub z),..., theta (sub k + 1) where theta (sub k + 1) is specified. The prior in question is the conditional distribution of theta (sub 1)/theta (sub k + 1). It is obtained by marginalization from the joint distribution of the theta's given theta (sub k + 1). Author

N85-10721# Council for Scientific and Industrial Research, Pretoria (South Africa).

A COMPARATIVE EVALUATION OF ALGORITHMS FOR GENERALIZED NETWORK PROBLEMS
D. C. Currin Apr. 1983 150 p refs
(TWISK-269) Avail: NTIS HC A07/MF A01

Efficient new algorithms expand the class of problems that are modeled and solved as networks. The typical graphical formulation of such networks facilitates communication. Generalized network problems constitute the widest class which is modeled within a network framework. The formulation of generalized network problems, and the adaptations made to the primal simplex algorithm to exploit their structure. Techniques for finding initial bases, selecting incoming arcs and updating node potentials are outlined, and three new techniques are introduced. Five programs, based on these techniques, are developed and evaluated using a series of test problems. Experimental deign is used to study the effect of problem related factors on the two best programs, and a complete listing of one of the programs, implemented in FORTRAN 77, is provided. Author

N85-10722# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
SOME CONCEPTS IN MULTI-CRITERIA OPTIMIZATION
B. D. Craven Mar. 1983 21 p refs
(CSIR-TWISK-299) Avail: NTIS HC A02/MF A01

A model is proposed for constrained optimization with two conflicting criteria, with some priority relation between them, not necessarily constant. Related questions of approximate shadow costs and duality are discussed. Author

N85-10723# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
THE APPROXIMATION OF NONSMOOTH SOLUTIONS OF HYPERBOLIC PARTIAL DIFFERENTIAL EQUATIONS
Barbara Kok Mar. 1983 25 p refs
(CSIR-TWISK-297) Avail: NTIS HC A02/MF A01

The approximation of the solution of a hyperbolic partial differential equation with periodic boundary conditions and nonsmooth, periodic initial data by a single-step dissipative method of order of accuracy r is studied. A suitable smoothing of the data by convolution with piecewise polynomials yields accuracy O(h (supra r)) for the approximation at mesh-points in a domain bounded away from the singularities. Author

N85-10724# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
LOCATION OF SEVERAL OUTLIERS IN MULTIPLE REGRESSION DATA USING ELEMENTAL DATA
Douglas M. Hawkins, Dan Bradu, and Gordon V. Kass (Witwatersrand Univ.) Apr. 1983 41 p refs
(CSIR-TWISK-300) Avail: NTIS HC A03/MF A01

The outlying tendency of any case in a multiple regression of p predictors may be estimated by drawing all subsets of size p of the remaining cases and using these to estimate the residual of the case. A robust location measure on this set then shows whether the point is outlying or not. Actual implementation uses only a finite random subset of such elemental residuals and may be implemented neatly using the scale contamination model and the EM algorithm. Author

N85-10725# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
OSCILLATORY INTEGRALS BY HERMITE INTERPOLATORY RULES
Ayse Alaylioglu Mar. 1983 17 p refs
(CSIR-TWISK-301) Avail: NTIS HC A02/MF A01

Hermite interpolatory quadrature formulas employing Basu, Clenshaow, Filippi, Filon and Polya nodes are generated with a view to providing high precision rules for oscillatory integrals. Numerical results illustrate the high accuracy and efficiency of the method. Of the nodes tested, Basu nodes yield the most accurate results in the case of rapid oscillations, while Filippi nodes give rise to efficient quadrature rules when the integrand has slight oscillations. Author

N85-10726# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
RECURSIVE CALCULATION OF CURVED FINITE ELEMENT STIFFNESS MATRICES
M. L. Baart and R. J. Y. McLeod (New Mexico State Univ., Las Cruces) Mar. 1983 24 p refs
(CSIR-TWISK-303) Avail: NTIS HC A02/MF A01

A method is proposed for the evaluation of integrals that occur in the calculation of stiffness matrices when isoparametric or high order transformation bases are used on finite elements with curved sides. The propagation of errors in the initial values for the various forms of recursion is analysed. Several factors involved in the selection of a suitable recursion technique are discussed. Numerical results indicate that recusion can be used successfully even for those values of the parameters for which numerical instability in the evaluation of the analytic forms of the integrals would normally necessitate the use of cubature techniques. Author

N85-10727# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
CORES OF TANGENT CONES AND CLARKE'S TANGENT CONE
D. H. Martin and G. G. Watkins (Stellenbosch Univ.) Mar. 1983 26 p refs
(CSIR-TWISK-314) Avail: NTIS HC A03/MF A01

The identification of core tangent cones is examined. The relationships between Clarke's tangent cone and core tangent cones of various types are discussed. M.A.C.

N85-10728# Council for Scientific and Industrial Research, Pretoria (South Africa).
NUMERICAL STUDIES IN NONLINEAR FILTERING
Yaakov Yavin Jul. 1983 253 p ref
(TWISK-305) Avail: NTIS HC A12/MF A01

Some approaches to the construction of finite-dimensional filters as approximate solutions to nonlinear state estimation problems are presented. Numerical procedures for the implementation of these filters are given, and the efficiency and applicability of these procedures is demonstrated by means of numerical experimentation. Markov chain construction and Kalman filtering are discussed. R.S.F.

N85-10729# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
THE INFERRING OF PREFERENCES FROM INDIFFERENCES IN MULTICRITERIA DECISION ANALYSIS
Theodor J. Stewart Mar. 1983 26 p refs
(CSIR-TWISK-306) Avail: NTIS HC A03/MF A01

An approximate preference ordering is deduced from statements of pairwise indifferences between decision alternatives by using multi-dimensional scaling. Much stronger evaluations of preference are possible by applying formal statistical inferential procedures to a simple parametric model, relating indifference to closeness on a scale defined by a linear function of attribute values. This is used to screen out a considerable proportion of less desirable decision alternatives. The method is illustrated by application to Rivett's problem of the hypothetical Town of Brove, for which a good matching with Rivett's utilities is obtained. The method provides useful preference orderings on the basis of less than twenty percent of all possible pairwise comparisons between alternatives. Author

N85-10730# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
MODEL DIAGNOSIS IN TWO-WAY TABLES BY MEANS OF ROW AND COLUMN EUCLIDEAN MAPS
Dan Bradu Apr. 1983 47 p refs
(CSIR-TWISK-307) Avail: NTIS HC A03/MF A01

Graphical model diagnosis procedures for two-way nxm tables were already proposed by Mandel and by Bradu and Gabriel, the latter using Gabriels biplot as a main tool. Manel's approach is reinterpreted within the framework of Response Surface Models, and considerably extended. Euclidean Maps are introduced; these

are graphical displays of rows and columns respectively, based on parameter estimates for the Multiplicative Interaction model. Besides yielding two-dimensional displays for the euclidean spatial structure of the rows and columns as points in R(supra n) and R (supra m) respectively, these plots which are computationally easy to obtain, permit a better model diagnosis which also applies to nonlinear response surfaces expressed in terms of latent variates, which are well described by Taylor expansions going up to second order terms. Extending the approach of Bradu and Gabriel, the biplot of the residuals matrix is used to diagnose Response Surface Models where the Taylor expansion of the response function goes beyond the terms of second order. Author

N85-10731# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
STURMIAN EXPANSION APPROXIMATION TO THREE-BODY SCATTERING
D. Eyre and H. G. Miller Apr. 1984 12 p refs
(CSIR-TWISK-309) Avail: NTIS HC A02/MF A01

An L(supra 2) discretization of continuum effects using Sturmian functions is tested in a model three-body problem. Numerical results are obtained in the low energy scattering region for a system of three bosons interacting via nonseparable pairwise interactions. The present results suggest that the method may be applicable to solving the more general N-body case. Author

N85-10732# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
SPURIOUS CENTER OF MASS EFFECTS IN A DYNAMICALLY DETERMINED BASIS
H. G. Miller and J. P. Vary (Iowa State Univ.) May 1983 13 p refs
(CSIR-TWISK-310) Avail: NTIS HC A02/MF a01

A practical method for reducing spurious center of mass (CM) effects in a dynamically determined basis is reviewed and demonstrated for two solutions of the Hartree-Fock (HF) equations in 16 sub 0. The HF ground state (lower intrinsic energy) is mixed in parity and angular momentum and has higher CM energy than the spherically symmetric solution of good parity. Projection after variation, followed by diagonalization of a CM Hamiltonian in this two state sub space to eliminate spurious excitations of the CM, produces a state with 250 keV lower intrinsic energy than just projection after variation of the HF ground states. Author

N85-10733# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
SIMULTANEOUS RATIONAL APPROXIMATION OF A FUNCTION AND ITS DERIVATIVES IN THE COMPLEX PLANE
A. L. Levin (Everyman's Univ., Tel Aviv) and D. S. Lubinsky Jun. 1983 26 p refs
(CSIR-TWISK-311) Avail: NTIS HC A03/MF A01

Some aspects of simultaneous rational approximation of a function and its derivatives in the complex domain are investigated. It is proven that the polynomial of simultaneous best approximation in the norm [F] = max ([F(J)] sub p,1 : O < or = J < or = L), is just a polynomial of best approximation to f(l), suitably integrated. Further sharp asymptotic results are obtained for the case where the order of the derivative tends to infinity as the degree of the approximation tends to infinity. M.G.

N85-10734# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
SENSITIVITY ANALYSIS IN GENERALIZED RATIONAL APPROXIMATION WITH RESTRICTED DENOMINATOR
Jacob Flachs Jun. 1983 15 p refs
(CSIR-TWISK-319) Avail: NTIS HC A02/MF A01

Generalized rational approximation with restricted denominator is viewed as a parametric program, in which all the given functions which are involved as well as the compact space T on which they are defined, play the role of parameters. Locally Lipschitz and a certain linear behavior are proved respectively for the optimal value and the solution set. In particular, these properties are shown for the case where a sequence T(k) is a subset of T converging to T is considered together with a convergent sequence of given functions. M.G.

N85-10735# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
THE INFORMATION IN THE MINOR PRINCIPAL COMPONENTS
Douglas M. Hawkins and L. Paul Fatti Aug. 1983 30 p refs Submitted for publication
(CSIR-TWISK-320) Avail: NTIS HC A03/MF A01

The minor principal components of a random vector x ae the orthonormal linear combinations of the variables in x which have minimum variance. This act may be used to detect interrelationships amongst the variables as well as to identify those variables which can be predicted with high accuracy from the other. Application of these ideas to the variable selection problem in multiple regression and to the identification of outliers in multivariate data are discussed. Author

N85-10736# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
THE CONVERGENCE OF GARLERKIN APPROXIMATION SCHEMES FOR SECOND-ORDER HYPERBOLIC EQUATIONS WITH DISSIPATION
B. Kok and T. Geveci Aug. 1983 40 p refs Submitted for publication
(CSIR-TWISK-325) Avail: NTIS HC A03/MF A01

Certain semi-discrete and fully discrete Galerkin approximation to the solution of an initial-boundary value problem for a second-order hyperbolic equation with a dissipative term are considered. Estimates are obtained in the energy and negative norms associated with the problem, yielding in particular H(1)- and L(2)-error estimates. The approximation to the initial data is taken, in this case, as the projection with respect to the energy inner product, onto the approximating space. Estimates for higher-order time derivatives are also obtained. M.G.

N85-10737# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
POLYNOMIAL AND POWER SERIES FGS-RINGS HAVE TRIVIAL COEFFICIENT RINGS
J. W. Brewer (Kansas Univ., Lawrence), C. Naude, and G. Naude Aug. 1983 7 p ref
(TWISK-326) Avail: NTIS HC A02/MF A01

It is shown that a polynomial or power series ring is an FGC ring only when the coefficient ring is a field or a direct sum of fields. Author

N85-10738# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
SPLINE-GALERKIN SOLUTION OF INTEGRAL EQUATIONS FOR 3-BODY SCATTERING ABOVE BREAK-UP
Ayse Alaylioglu, D. Eyre, M. Brannigan (Georgia Univ., Atlanta), and J. P. Svenne (Manitoba Univ., Winnepeg) Aug. 1983 34 p refs
(TWISK-327) Avail: NTIS HC A03/MF A01

A Galerkin method for solving the integral equations for three body scattering at energies above the break up threshold is investigated. Cubic spline approximants with multiple knots are used to construct a nonsmooth solution function. Error bounds for the approximation are provided. Numerical results are obtained both for a system of spin-0 (boson) and spin-1/2 (fermion) particles interacting via separable two body potentials. The results demonstrate that the numerical treatment of this problem is both robust and accurate with a small number of basis functions. M.G.

N85-10739# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
A SUBSPACE ITERATION METHOD FOR DETERMINING A DOMINANT SPAN OF EIGENVECTORS
H. G. Miller and M. C. Steenkamp Sep. 1983 20 p refs
(TWISK-329) Avail: NTIS HC A02/MF A01

A subspace iteration method for determining a dominant span

of eigenvectors that under certain conditions may be alternative to the full Lanczos algorithm is presented. The present mehod is an extension of the 2x2 Lanczos method for iteratively determining a dominant eigenvector and exhibits better convergence properties than the simple power method. The properties of the method are discussed and a numerical example is presented. Author

N85-10740# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
ON BEZOUT DOMAINS, ELEMENTARY DIVISOR RINGS, AND POLE ASSIGNABILITY
J. W. Brewer (Kansas Univ., Lawrence), C. Naude, and G. Naude Sep. 1983 19 p refs
(CSIR-TWISK-330) Avail: NTIS HC A02/MF A01

The question of pole assignability property of Bezout domains was stressed. A characterization of Bezout domains with pole assignability property is given, extending a previous result of Bumby, Sontag, Sussman and Vasconcelos. Finally, non semi-quasilocal Bezout domains of arbitrary dimension with pole assignability property indicate that dimension is not an important issue in this problem. B.G.

N85-10741# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
A WEIGHTED POLYNOMIAL INEQUALITY
D. S. Lubinsky Oct. 1983 10 p refs
(CSIR-TWISK-332) Avail: NTIS HC A02/MF A01

In the theory of orthogonal polynomials for weights with non-compact support, much use is made of inequalities relating weighted integrals of polynomials over infinite and finite ranges. Using a short new method of proof, it is shown that these inequalities hold for very general weights in L sub P and certain Orlicz spaces. B.W.

N85-10742# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
UPWIND COMPACT FINITE DIFFERENCE SCHEMES
I. Christie (West Virginia Univ.) Oct. 1983 21 p refs
(CSIR-TWISK-334) Avail: NTIS HC A02/MF A01

The standard compact finite difference scheme may break down in convection-dominated problems. An upwinding of the method, which maintains the fourth-order accuracy, is suggested and favorable numerical results are found for a number of test problems. Author

N85-10743# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
ON TWO CONCEPTS OF FUNDAMENTAL MATCHING
M. Orlowski Oct. 1983 11 p refs
(CSIR-TWISK-335) Avail: NTIS HC A02/MF A01

An example is presented which shows that two conepts of fundamental matching of compacta differ in that one is a shape operation, whereas the other is not. The first idea for adapting the notion of matching of compacta along a map to shape theory was based on the replacement of the map by a fundamental seuquence. A minor change to this first idea in which approaching maps rather than fundamental sequences are used, led to a definition of the operation of fundamental matching along an approaching map. This second operation is also not topologically unique, but it is known to be unique up to shape, in other words, it is a shape operation. B.W.

N85-10744*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LEGENDRE-TAU APPROXIMATION FOR FUNCTIONAL DIFFERENTIAL EQUATIONS. PART 3: EIGENVALUE APPROXIMATIONS AND UNIFORM STABILITY Final Report
Kazufumi Ito Aug. 1984 36 p refs
(Contract NAS1-17070)
(NASA-CR-172447; ICASE-84-42; NAS 1.26:172447) Avail: NTIS HC A03/MF A01 CSCL 12A

The stability and convergence properties of the Legendre-tau approximation for hereditary differential systems are analyzed. A charactristic equation is derived for the eigenvalues of the resulting approximate system. As a result of this derivation the uniform exponential stability of the solution semigroup is preserved under approximation. It is the key to obtaining the convergence of approximate solutions of the algebraic Riccati equation in trace norm. B.W.

N85-10745# Naval Biodynamics Lab., New Orleans, La.
KOLMOGOROV-SMIRNOV GOODNESS-OF-FIT TEST: CORRECTED FOR USE WITH EEG-LIKE DATA
M. S. Weiss Apr. 1984 20 p
(AD-A144711; NBDL-84R003) Avail: NTIS HC A02/MF A01 CSCL 12/1

The one-sample Kolmogorov-Smirnov goodness-of-fit test (KS) is designed for use with independent data and can be highly sensitive to correlated data. Standard critical values for KS cannot be used with data with known correlations. For data with EEG-like spectra (low frequency, high amplitude spectral peaks) an empirically derived correction for KS provides correct critical values and retains much of the power of the original KS. The correction is based on a simple quadratic expression involving a parameter, tau, computed from zero-crossing measurements. GRA

N85-10746# Wisconsin Univ., Madison. Mathematics Research Center.
PARTITIONS OF UNITY AND APPROXIMATION Technical Summary Report
C. de Boor and R. DeVore Jun. 1984 12 p
(Contract DAAG29-80-C-0041; Grant NSF DMS-83-20562)
(AD-A144717; MRC-TSR-2704) Avail: NTIS HC A02/MF A01 CSCL 12/1

This document shows that for certain translation invariant spaces S, a necessary and sufficient condition for the eventual denseness of the corresponding scaled spaces S sub h is that S contain a stable and locally supported partition of unity. These results have been motivated by recent work on approximation by multivariate piecewise polynomials on regular meshes.
Author (GRA)

N85-10747# Wisconsin Univ., Madison. Mathematics Research Center.
BIRKHOFF ORBITS FOR NON-MONOTONE TWIST MAPS Technical Summary Report
G. R. Hall Jun. 1984 21 p
(Contract DAAG29-80-C-0041)
(AD-A144718; MRC-TSR-2709) Avail: NTIS HC A02/MF A01 CSCL 12/1

Recently it has been shown that twist maps of the annulus, which arise naturally in such diverse problems as the 3-body problem, billiards in a convex table and Hopf bifurcation of maps of the plane, possess many simple periodic orbits and quasi-periodic orbits. The original proofs of this used a variational technique requiring a globally defined action and which limited the theorem to so called monotone twist maps. The restriction to monotone twist maps is fairly severe since, for example, the composition of a monotone twist map with itself need not be a monotone twist map. Topological techniques may also be used to obtain these theorems and it is the purpose of this report to point out that, after suitably altering the definitions, the topological arguments apply to a much larger family of twist maps. GRA

N85-10748# Wisconsin Univ., Madison. Mathematics Research Center.
SOME FAMILIES OF NEAR-ORTHONORMAL ANALYTIC AND HARMONIC FUNCTIONS Technical Summary Report
L. Reichel Jul. 1984 43 p
(Contract DAAG29-80-C-0041)
(AD-A144722; MRC-TSR-2714) Avail: NTIS HC A03/MF A01 CSCL 12/1

The approximation of analytic or harmonic functions on plane finitely connected domains with smooth boundary curves is considered, and several easily computable families of near-orthonormal functions are described. The functions can be used

in fast Galerkin schemes for numerical approximation. Several numerical examples are presented. Author (GRA)

N85-10749# Wisconsin Univ., Madison. Mathematics Research Center.
THE RATE OF CONVERGENCE OF A CLASS OF BLOCK JACOBI SCHEMES Technical Summary Report
W. E. Ferguson, Jr. Jul. 1984 13 p
(Contracts DAAG29-80-C-0041; DE-AL02-82ER-12046)
(AD-A144738; MRC-TSR-2716) Avail: NTIS HC A02/MF A01 CSCL 12/1

The solution of many elliptic and parabolic partial differential equations lead to the need to solve large linear systems. With the usual serial computer architecture point iterative schemes frequently led to the efficient solution of many of these systems. In a point iterative scheme the current estimate of the solution is improved in a repetitive fashion by modifying only one component of the solution. The advent of vector and parallel computer architectures now allow the efficient solution of these systems by using block iterative schemes. In a block iterative scheme the current estimate of the solution is improved in a repetitive fashion by modifying several components of the solution. Since point iterative schemes can be viewed as particularly simple block iterative schemes one would expect to find that block iterative schemes can potentially converge faster than point iterative schemes. In this paper the rate of convergence of one class of block iterative schemes is precisely determined. GRA

N85-10750# Wisconsin Univ., Madison. Mathematics Research Center.
ON WAVE PROPAGATION IN LINEAR VISCOELASTICITY Technical Summary Report
W. J. Hrusa and M. Renardy Jul. 1984 30 p
(Contract DAAG29-80-C-0041; Grant NSF MCS-82-15064)
(AD-A144739; MRC-TSR-2713) Avail: NTIS HC A03/MF A01 CSCL 12/1

This document discusses the initial value problem in one-dimensional linear visco-elasticity with a step-jump in the initial data. If the memory kernel is sufficiently smooth on (infinity), the solution exhibits discontinuities propagating along characteristics and a (higher order) stationary discontinuity at the position of the original step-jump. For a singular memory kernel, the propagating waves are smoothed in a manner depending on the nature of the singularity in the kernel, but the stationary discontinuity remains. Also discussed are the effects of these phenomena on the regularity of solutions with arbitrary initial data. GRA

N85-10751# Wisconsin Univ., Madison. Mathematics Research Center.
A TRIVARIATE CLOUGH-TOCHER SCHEME FOR TETRAHEDRAL DATA Technical Summary Report
P. Alfeld Jun. 1984 29 p
(Contracts DAAG29-80-C-0041; DE-AL02-82ER-12046)
(AD-A144740; MRC-TSR-2702) Avail: NTIS HC A03/MF A01 CSCL 12/1

An interpolation scheme is described for values of position, gradient and Hesian at scattered points in three variables. The domain is assumed to have been tesselated into tetrahedra. The interpolant has local support, is globally once differentiable, piecewise polynomial, and reproduces polynomials of degree up to three exactly. The scheme has been implemented in a FORTRAN research code. Author (GRA)

N85-10752# Pittsburgh Univ., Pa. Dept. of Chemistry.
SHIFT-VARIANT MULTIDIMENSIONAL SYSTEMS Annual Report, 1 Feb. 1983 - 31 Jan. 1984
N. K. Bose 27 Mar. 1984 80 p
(Grant AF-AFOSR-0038-83)
(AD-A144756; AFOSR-84-0669TR) Avail: NTIS HC A05/MF A01 CSCL 12/1

To a great extent the techniques for analysis and restoration of images has been developed under the assumption that the system is linear shift-invariant (LSI). These techniques are successful in some cases because a system which is diffraction-limited or a system whose object plane undergoes uniform linear motion perpendicular to the system reference axis does indeed satisfy these assumptions. However, LSI systems are singled out for study mainly because of the widespread understanding of the Fourier Transform theory along with well-known fast algorithms for its implementation. In comparison with LSI systems, very little work has been done on linear shift-variant (LSV) systems. Most of the research on two dimensional LSV systems has been done on restoration techniques by means of coordinate transformations. This technique, decomposes the LSV system into a distortion of the input plane followed by a shift-invariant operation and terminated by a distortion of the output plane. The primary objective of this research is to provide not only a mathematical structure for the state-space modeling of discrete LSV systems but to apply this model to the problems of efficient analysis and deconvolution of multidimensional systems. GRA

N85-10753# Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
ROBUST RATE CONTROL SYSTEM DESIGNS FOR A SUBMERSIBLE M.S. Thesis
Lawrence John Dreher May 1984 140 p
(Contract N66314-70-A-0073)
(AD-A144792) Avail: NTIS HC A07/MF A01 CSCL 12/1

Two robust rate control system designs are carried out for a submersible (modeled by the NSRDC 2510 equations) in a turn using the Linear Quadratic Gaussian approach with Loop Transfer Recovery. Separate command channels allow the submersible to maneuver independently in horizontal and vertical planes; the vehicle operator controls bearing and depth rates through a joystick-like device. Fin configuration is the conventional cruciform stern without differential control. The first compensator design r - theta controller directly controls two vehicle state variables: pitch theta and vehicle angular velocity, r, about the z-axis. The other system (the psi - z controller), controls yaw (or heading) rate psi and depth rate (z) directly. However, this design relies on linearized equations of yaw and depth rate to be employed by the compensator for state reconstruction. A tool for Kalman Filter loop shaping is developed in which state variables are scaled to provide good loop shapes and then recovered to get controllers that are robust. Both controllers are compared on the basis of performance in a nonlinear simulation. A robustness comparison is also conducted. Based on limited simulation data, this thesis concludes that the psi - Z controller provides better control of depth rate than the r - theta controller. Bearing rate performance is essentially equal in both designs; however, the psi - z controller appears less robust in certain frequency ranges. GRA

N85-10754# Pittsburgh Univ., Pa. Center for Multivariate Analysis.
SOME WEAK AND STRONG LAWS OF LARGE NUMBERS FOR D(0,1) - VALUED RANDOM VARIABLES
X. C. Wang and M. B. Rao Jul. 1984 45 p
(Contract F49620-82-K-0001)
(AD-A144845; TR-84-36; AFOSR-84-0714TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

Pointwise Weak Law of Large Numbers and Weak Law of Large Numbers in the norm topology of D(0,1) are shown to be equivalent under uniform convex tightness and uniform integrability conditions for weighted sums of a sequence of random elements in D(0,1). Uniform convex tightness and uniform integrability conditions are jointly characterized. Marcinkiewicz-Zygmund-Kolmogorov's and Brunk-Chung's Strong Laws of Large Numbers are derived in the setting of D(0,1) space under uniform convex tightness and uniform integrability conditions. Equivalence of pointwise convergence, convergence in the Skorokhod topology and convergence in the norm topology for sequences in D(0,1) is studied. Author (GRA)

N85-10755# Wisconsin Univ., Madison. Mathematics Research Center.
A PERTURBATION SOLUTION FOR RIGID DUMBBELL SUSPEN-

SIONS IN STEADY SHEAR FLOW Technical Summary Report
S. Kim and X. Fan Jun. 1984 14 p
(Contract DAAG29-80-C-0041; Grant NSF CPE-81-04705)
(AD-A144876; MRC-TSR-2700) Avail: NTIS HC A02/MF A01 CSCL 12/1

The rigid dumbbell in a Newtonian solvent under hyrodynamic and Brownian forces is a simple model of solutions of rigid macromolecules with both theoretical and pedagogical applications 1,2. In this note, we show that expansion solutions in small, dimensionless shear rates, lambda gamma, have a finite radius of convergence. We also show that these solutions can be analytically continued to a much larger domain by standard techniques for accelerating the convergence of series. GRA

N85-10756# California Univ., Berkeley. Operations Research Center.
SIMULATION USES OF THE EXPONENTIAL DISTRIBUTION
S. M. Ross and Z. Schechner Jun. 1984 22 p
(Grant AF-AFOSR-0122-81)
(AD-A144940; ORC-84-6; AFOSR-84-0819TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper indicates how exponential random variables can be effeciently used in a variety of simulation problems. One of the problems is the simulation of order statistics from a normal population. The authors discuss the general problem of simulating order statistics and then consider the normal case. They start by showing how the Von-Neumann rejection approach via the exponential can be modified to become an efficient algorithm for generating a normal and then present a method for generating normal order statistics. They show how to use the exponential to efficiently simulate random permutations with weights. They consider the problem of simulating a 2-dimensional Poisson process both for a homogeneous and nonhomogeneous Poisson process.
Author (GRA)

N85-10757# Scientific Research Associates, Inc., Glastonbury, Conn.
SOLUTION OF THE BOLTZMANN TRANSPORT EQUATIONS FOR A PERMEABLE BASE TRANSISTOR Final Report, 17 Oct. 1983 - 31 May 1984
R. C. Buggeln, J. P. Kreskovsky, and H. L. Grubin 20 Jul. 1984 37 p
(Contract F49620-83-C-0157)
(AD-A144969; SRA-R84-910005-F; AFOSR-84-0707TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

A description of a numerical method for solving the Boltzmann transport equations is presented. This numerical technique is applied to the case of the solution of the Boltzmann equations for a gallium arsenide permeable base transistor. Calculated results are presented for two base potentials.
Author (GRA)

N85-10758# Ballistic Research Labs., Aberdeen Proving Ground, Md.
METHODS FOR NUMERICAL DIFFERENTIATION
C. Masaitis Jul. 1984 22 p
(AD-A145058; AD-F300453; ARBRL-MR-03369) Avail: NTIS HC A02/MF A01 CSCL 12/1

Divided differences, Berstein polynomials, moving polynomial arc, spline approximation, regularization, and autoregressive procedures for estimating derivative of a tabular function are compared and their common features as well as differences are discussed. It is shown that these methods can be arranged in a sequence of increasing refinement. GRA

N85-10759# Massachusetts Univ., Amherst.
RANGE-RESIDUATED MAPPINGS
M. F. Janowitz Aug. 1984 20 p
(Contract N00014-79-C-0629)
(AD-A145148; J8402) Avail: NTIS HC A02/MF A01 CSCL 12/1

Range-residuated mappings are introduced and their order theoretic and semigroup properties studied. Applications are given to cluster analysis as well as to the simplification of digital images. Author (GRA)

N85-10760# Fondazione Ugo Bordoni, Rome (Italy).
DETECTION AND ESTIMATION OF IMAGE CONTOURS [RIVELAZIONE E STIMA DI CONTORNI DI FIGURE IN UNA IMMAGINE]
Roberto Cusani and Guido Diblasio (Rome Univ.) Dec. 1983 51 p refs In ITALIAN
(FUB-35-1983) Avail: NTIS HC A04/MF A01

Image contour analysis is treated as the extraction of a signal waveform from noise and is limited to fixed images in black and white. Kalman filters are used on data furnished by a parameter estimating operator which acts sequentially on neighboring contour line elements. An adaptive version of the filter is also described. The results may be used to implement a strategy of image signal encoding or to detect features to recognize objects in an image.
Author (ESA)

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N85-10761 Bayerische Akademie der Wissenschaften, Munich (West Germany). Geodaetische Kommission.
TESTING OF INEQUALITY HYPOTHESES IN LINEAR MODELS USING THE BAYES METHOD Ph.D. Thesis - Bonn Univ. [TEST VON UNGLEICHUNGSHYPOTHESEN IN LINEAREN MODELLEN MIT BAYES-VERFAHREN]
Knut Riesmeier 1984 72 p refs In GERMAN
(Ser-C-292; ISBN-3-7696-9342-6; ISSN-0065-5323) Copyright. Avail: Issuing Activity

The multivariate t-distribution and its most important characteristics are deduced. Application of Bayes method to linear models is outlined. Bayes method in the regression model is described and the equivalence with the standard hypotheses test is demonstrated. An hypotheses test with inequality restrictions is developed, as is an insensitive hypotheses test allowing variation domains for the parameters and hence model calculated hypotheses. A Bayes method of model choice with mixed distributions is developed. It is complex but allows a distinction between deformations of different orders of magnitude and a probability evaluation of the possible models. The method - hypotheses tests with inequality restrictions, hypotheses tests with parameter variation domains, and Bayes method of model choice are numerically applied in the deformation analysis of a geodetic network, and the results are discussed. Author (ESA)

N85-10762# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
ON THE PONTRYAGIN PRINCIPLE FOR STOCHASTIC OPTIMAL CONTROL
D. B. Craven (Melbourne Univ., Australia) Aug. 1983 25 p refs (TWISK-328) Avail: NTIS HC A02/MF A01

A Pontryagin principle for stochastic optimal control problems is shown to depend on certain structural features of the problem, such as suitable convexity hypotheses, or a certain kind of differentiability, but is shown not to be closely linked with the kind of differential equation or stochastic integral employed. Author

N85-10763# Wisconsin Univ., Madison. Mathematics Research Center.
INFLUENTIAL OBSERVATIONS IN TIME SERIES Technical Summary Report
D. Pena Jul. 1984 35 p
(Contract DAAG29-80-C-0041)
(AD-A144719; MRC-TSR-2718) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper studies how to identify influential observations in univariate ARIMA time series models and how to measure their effects on the estimated parameters of the model. The sensitivity

of the parameters to the presence of either additive or innovational outliers is analyzed, and influence statistics based on the Mahalanobis distance are presented. The statistic linked to additive outliers is shown to be very useful to indicate the robustness of the fitted model to the given data set. Its application is illustrated using simulation results and a relevant set of historical data.
Author (GRA)

N85-10764# Ballistic Research Labs., Aberdeen Proving Ground, Md.
CONSTRUCTION OF APPROXIMATE CONFIDENCE INTERVALS FOR PROBABILITY-OF-KILL VIA THE BOOTSTRAP
M. S. Taylor and B. A. Bodt Jul. 1984 31 p Original contains color illustrations
(DA Proj. 1L1-61102-AH-43)
(AD-A144761; ARBRL-TR-02570) Avail: NTIS HC A03/MF A01 CSCL 12/1

The bootstrap, a computer-intensive procedure for data analysis, was applied to an estimation problem to enable a statement to be made about the variability inherent in a probability-of-kill estimate P sub k. The bootstrap was applied to a stratified sample, rather than a simple random, sample and its performance evaluated in this framework, first in an abstract situation where the parameter P sub k was known and then in three situations where the parameter P sub k was unknown, but an estimate provided by current vulnerability analysis procedures was available. The investigation was carried out for several grid sizes, or alternatively, for several levels of detail, to study the effect of grid size on the estimation of P sub k and the reliability of the confidence intervals constructed. Author (GRA)

N85-10765# American Coll. Testing Program, Iowa City, Iowa.
AN INVESTIGATION OF THE EFFECT OF CORRELATED ABILITIES ON OBSERVED TEST CHARACTERISTICS
R. L. McKinley and M. D. Reckase May 1984 61 p
(Contract N00014-81-K-0817; RR0-4204)
(AD-A144869; RR-84-1-ONR) Avail: NTIS HC A04/MF A01 CSCL 12/1

The results of this study indicated that the presence of correlated abilities has important implications for the characteristics of test data, and for the application of multidimensional item response theory models. It was concluded that it is necessary to consider latent item structure as well as latent ability structure in test construction and analysis. It was also concluded that use of multidimensional item response theory models that do not explicitly account for correlated abilities may result in misinterpretation of the underlying dimensions. It was suggested that research should be conducted to determine the nature of the misinterpretation and to perhaps develop an item response theory analogue to factor rotation. GRA

N85-10766# Navy Fleet Material Support Office, Mechanicsburg, Pa. Operations Analysis Div.
PROBABILITY DISTRIBUTION OF LEADTIME DEMAND
A. P. Urban, J. A. Mellinger, and G. Evans 29 Jun. 1984 66 p
(AD-A144952; Rept-159) Avail: NTIS HC A04/MF A01 CSCL 12/1

This study examines 11 probability distributions to determine which distribution best describes demand during leadtime for 1H Cognizance Symbol (Cog) material. Proper selection of the distribution is criteria in the accurate calculation of reorder levels. Actual leadtime demand observations were calculated in the study. Histograms, a chi-square goodness-of-fit test and a Mean Square Error measure were used to analyze the leadtime demand data. Histograms of the data suggested the following distributions to describe leadtime demand: Exponential, Gamma, Bernoulli-Exponential, Poisson, Negative Binomial and Geometric. The chi-square goodness-of-fit test indicated that none of these distributions fit the computed leadtime demand data across the entire range of the distribution. However, a relative test of the right hand tails of the distributions, which are most critical in determining reorder levels, indicated that the Bernoulli-Exponential provided the best relative fit for 1H Cog items. Author (GRA)

N85-10767# California Univ., Riverside. Dept. of Mathematics.
HARMONIZABLE, CRAMER, AND KARHUNEN CLASSES OF PROCESSES
M. M. Rao 12 Jul. 1984 49 p
(Contract N00014-84-K-0356)
(AD-A144984; TR-9) Avail: NTIS HC A03/MF A01 CSCL 12/1

A classification of second order processes related to the harmonizable series is given. The flexibility of Karhunen classes and their use in the analysis of the spectral domain of harmonizable class is presented in detail. The role of multiplicity and its use in inference problems are included. Linear prediction of nonstationary processes with differential and polynomial filters and least-squares estimation and related problems are discussed at length.
Author (GRA)

N85-10768# California Univ., Berkeley. Operations Research Center.
CREDIBILITY APPROXIMATIONS FOR BAYESIAN PREDICTION OF SECOND MOMENTS
W. S. Jewell and R. Schnieper Mar. 1984 44 p
(Grant AF-AFOSR-0122-81)
(AD-A144996; ORC-84-3; AFOSR-84-0820TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

Credibility theory refers to the use of linear least-squares theory to approximate the Bayesian forecast of the mean of a future observation; families are known where the credibility formula is exact Bayesian. Second-moment forecasts are also of interest, for example, in assessing the precision of the mean estimate. For some of these same families, the second-moment forecast is exact in linear and quadratic functions of the sample mean. On the other hand, for the normal distribution with normal-gamma prior on the mean and variance, the exact forecast of the variance is a linear function of the sample variance and the squared deviation of the sample mean from the prior mean. Buhlmann has given a credibility approximation to the variance in terms of the sample mean and sample variance. This paper presents a unified approach to estimating both first and second moments of future observations using linear functions of the sample mean and two sample second moments; the resulting least-squares analysis requires the solution of a 3 x 3 linear system, using 11 prior moments from the collective and giving joint predictions of all moments of interest. Previously developed special class follow immediately. For many analytic models of interest, one can replace the 3-dimensional joint prediction with three independent credibility forecasts using the natural statistics for each moment. Author (GRA)

N85-10769# Arinc Research Corp., Annapolis, Md.
STOCHASTIC PROPERTIES OF A SEQUENCE OF INTERFAILURE TIMES UNDER MINIMAL REPAIR AND UNDER REVIVAL
H. S. Balaban and N. D. Singpurwalla (George Washington Univ.) 20 Aug. 1983 16 p
(Contracts N00014-77-C-0263; N00019-82-C-0458)
(AD-A145003) Avail: NTIS HC A02/MF A01 CSCL 12/1

Most of the literature on the topic of interfailure times following repair is based on the assumption of maximal repair; that is, a failed item is restored to a condition equal to that of a new item. For some applications, the validity of this assumption has been challenged. This paper studies the situation wherein the failed item is assumed to have been restored to a condition equal to its condition just prior to failure. This is known as minimal repair. The author contrasts the two repair policies, cites some implications of minimal repair, and obtains some preservation properties. Finally, the draws attention to the fact that under certain conditions, minimal repair actions generate a class of survival functions which cannot be described by any of the well known properties of ageing studied in reliability theory. Author (GRA)

N85-10770# Florida State Univ., Tallahassee. Dept. of Statistics.
AN INTEGRAL INEQUALITY WITH APPLICATIONS TO ORDER STATISTICS
P. J. Boland (University Coll., Dublin) and F. Proschan Jun. 1984

19 p
(Contract F49620-82-K-0007)
(AD-A145081; FSU-STATISTICS-M681; TR-83-169-AFOSR; AFOSR-84-0713TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Document discusses life distribution functions. Applications in reliability theory and order statistics are given. GRA

N85-10771# Florida State Univ., Tallahassee. Dept. of Statistics.
TOTAL POSITIVITY. A REVIEW
J. S. Kim and F. Proschan Jun. 1984 20 p
(Contract F49620-82-K-0007)
(AD-A145205; FSU-STATISTICS-M663; TR-83-159-AFOSR; AFOSR-84-0717TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The main objective of this paper is to review the concepts of total positivity, which plays an important role in various domains of mathematics and statistics. This article describes the power and scope of total positivity, and samples the great variety of fields of its applications. Author (GRA)

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N85-10772# General Electric Co., Schenectady, N. Y.
SINGULAR PERTURBATIONS, COHERENCY AND AGGREGATION OF DYNAMIC SYSTEMS
Sep. 1983 97 p refs
(Contract DE-AC05-77ET-29104)
(DE84-014166; DOE/ET-29104/1) Avail: NTIS HC A05/MF A01

In this report a time scale modeling methodology based on singular perturbation technique has been developed. In contrast to most of the previous research on singular perturbations which focuses only on the asymptotic aspect of the method, that is, the validity of the reduced model approximation as the singular perturbation parameter goes to zero, the methodology exploits system properties in defining subsystems and their hierarchies. The resulting reduced models are physically meaningful and hence would give insights to the pattern of dynamic interactions present in the system, thus providing a new departure point for control system design. DOE

N85-10773# Fondazione Ugo Bordoni, Rome (Italy).
TIME INVARIANT MEMORYLESS NONLINEAR SYSTEMS IDENTIFICATION METHOD [UN METODO DI IDENTIFICAZIONE DI SISTEMI NON LINEARI TEMPO INVARIANTI SENZA MEMORA]
Odoardo Brugia, Giovanni Campanini, Salvatore Improta (FATME S.p.A.), and William Wolfowicz Apr. 1983 32 p refs In ITALIAN
(FUB-9-1983) Avail: NTIS HC A03/MF A01

A method based on the polynomial representation of system input/output characteristics is presented. The coefficients of the polynomial are determined by numerical processing of the device response to sinusoidal excitation. The method is successfully utilized to simulate jitter conditions in the design of a data system working at 565 Mb/sec. Author (ESA)

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N85-10774 Technische Univ., Munich (West Germany). Inst. fuer Mathematik.
ON THE COMMUTANT OF AN IRREDUCIBLE SET OF OPERATORS IN REAL HILBERT SPACE
D. P. L. Castrigiano and U. Mutze Nov. 1983 20 p refs
(TUM-M8316) Copyright. Avail: Issuing Activity

The relation between irreducibility and the structure of the commutant is studied for a set of linear bounded operators on a real Hilbert space of arbitrary dimension. The results are applied to the investivation or irreducible sets of semilinear operators on a quaternionic Hilbert space. Author (ESA)

N85-10775# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
ESTIMATES OF FREUD-CHRISTOFFEL FUNCTIONS FOR SOME WEIGHTS WITH THE WHOLE REAL LINE AS SUPPORT
D. S. Lubinsky Aug. 1983 56 p refs Submitted for publication
(CSIR-TWISK-323) Avail: NTIS HC A04/MF A01

The Christoffel functions are of considerable importance in investigating asympotic problems associated with the orthonormal polynomials for a weight w to the second power. The asymptotic behavior of the Freud-Christoffel functions are described. M.A.C.

N85-10776# Wisconsin Univ., Madison. Mathematics Research Center.
QUASISTABLE PARAMETRIC OPTIMIZATION WITHOUT COMPACT LEVEL SETS Technical Summary Report
L. McLinden Jun. 1984 11 p
(Contract DAAG29-80-C-0041; Grant NSF MCS-81-02684)
(AD-A144716; MRC-TSR-2708) Avail: NTIS HC A02/MF A01 CSCL 12/1

The well-known perturbational duality theory for convex optimization is refined to handle directly, in locally convex Hausdorff spaces, problems involving noncoercive convex functionals together with unbounded densely defined linear operators or, more generally, convex processes. The theory presented includes conjugacy, recession, and epsilon-subdifferential formulas for the two fundamental pairs of dual operations and also includes systematic treatment of epsilon-solutions. Author (GRA)

N85-10777# Bielefeld Univ. (West Germany). Zentrum fuer interdisziplinaere Forschung.
SEMICLASSICAL THEORY OF RESONANCES
H. J. Korsch (Kaiserlautern Univ., West Germany) Apr. 1984 21 p refs
(Rept-67) Avail: NTIS HC A02/MF A01

First order semiclassical methods for characterizing and computing resonances are developed. Resonances are defined as complex energy poles of the S-matrix, i.e., the corresponding solution of the Schroedinger equation is purely outgoing at infinity. Feshbach resonances in curvecrossing systems are treated and a more general case of semiclassical resonances in higher dimensional systems is discussed for the separable case of field ionization of hydrogenic atoms. The general (nonseparable) case is sketched. Author (ESA)

N85-10778# Technische Hochschule, Darmstadt (West Germany). Fachbereich Mathematik.
BOUNDARY BEHAVIOR OF ANALYTIC FUNCTIONS, ANALYTIC WAVE FRONT SETS AND THE INTERSECTION PROBLEM OF EHRENPREIS
Otto Liess Mar. 1984 60 p refs Submitted for publication
(Preprint-809) Avail: NTIS HC A04/MF A01

Theorems concerning the boundary behavior of analytic functions are reviewed and results for the intersection problem are described. An application to Bochner's tube theorem and the Cameron Storvick theorem is outlined. Equivalence of definitions of the analytic wave front set is considered. Proofs are organized such that a local form of Martineau's version of the edge-of-the-wegde theorem is obtained as a byproduct, and such that a variant of a result that any hyperfunction u is locally of the form u = J (D) f, f is a member of C sup inf, J (D) an infinite order (infraexponential) differential operator, is proved. Author (ESA)

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N85-10779# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).

COMMENT ON THE VALIDITY OF AN L2 TREATMENT OF THE CENTER OF MASS PROBLEM
H. G. Miller and D. Eyre Aug. 1983 7 p refs Submitted for publication
(CSIR-TWISK-324) Avail: NTIS HC A02/MF A01

The use of L(2) discretization scheme in the center of mass problem as an alternative to restoring translational invariance is supported by some numerical calculations employing similar approximation schemes in the three-body problem. In the latter case the results may be compared with those obtained from exact three-body calculations. Author

N85-10780# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ON THE CALCULATING MODELS OF PERMANENT MAGNETS
S. Yushi 26 Jul. 1984 14 p Transl. into ENGLISH from Dianzi Xuebao (China), v. 10, no. 5, Sep. - Oct. 1982 p 86-89
(AD-A145111; FTD-ID(RS)T-0718-84) Avail: NTIS HC A02/MF A01 CSCL 12/1

Two improvements were proposed for two calculating models for permanent magnets (the scalar potential model and the vector potential model) in this paper. Volumetric density was replaced by an appropriate hypothetical surface density of magnetic monopole (or surface bound current density) which did not vary with the operating point. The definition of magnetic reluctivity was correspondingly modified in the vector potential model to simplify the calculation and computer program. The improved models have been proven through computation and experiments. Author

N85-10781# Department of the Army, Washington, D. C.
SHOCK ELECTROMECHANICAL ENERGY CONVERTER WITH PERMANENT MAGNET Patent Application
J. K. Thompson, inventor (to Army) Filed 5 Jul. 1984 13 p
(AD-D011228; US-Patent-Appl-SN-628096) Avail: NTIS HC A02/MF A01 CSCL 20/3

An explosively operated device by which a strong magnetic field pulse and an electric current pulse of microseconds duration is produced. A cylindrical magneti is used to initiate the fields, and its energy source is an explosive filled metal tube. Within the converter itself, the lines of magnetic flux are essentially axial. When an explosive charge in the central tube is detonated, the end of the tube flares radially, and the tube begins to expand along it length. As it does so, the tube compresses the magnetic field against the inner surface of a magnet. Simultaneously, a helical coil inside the converter experiences a rapid increase in flux density, thus satisfying Faraday's law. This interaction causes a pulse of electric current to be fed into the turns of the magneto-cumulative generator as its initial mangetic field is maximized. As the central tube expands against the inside of the coil, it shorts out the turns one-by-one as the detonation wave travels axially along the converter. This action progressively reduces the inductance of the circuit, thus increasing the current output of the converter. Author (GRA)

N85-10782# California Univ., Livermore. Lawrence Livermore Lab.
INTERACTION OF A STREAM OF DIELECTRIC SPHERES IN AN ELECTRIC FIELD IN A HIGH VACUUM
Charles D. Hendricks and Kyekyoon Kim (Illinois Univ., Urbana) 25 May 1984 14 p refs Presented at the IEEE-IAS Ann. Meeting, Mexico City, 3-7 Oct. 1983
(Contract W-7405-eng-48)
(DE84-014714; UCRL-89356-Rev-1; CONF-831070-2-Rev-1) Avail: NTIS HC A02/MF A01

The interaction of a stream of dielectric spheres in an electric field in a high vacuum was investigated both theoretically and experimentally, motivated by an attempt to detect isolated quarks in matter. The theoretical analysis is intended to pinpoint the basic interaction mechanism by which a stream of dielectric spheres becomes destabilized in an electric field. One result of this analysis is a suggested method by which the destabilizing forces can be eliminated. The experiments performed are intended to study the behavior of a stream of uniform liquid drops in an electric field in a high vacuum. It is seen from these experiments that the deflections of any two drops in the stream with charges differing by one electronic charge are the same except for the effects of some destabilizing forces. DOE

N85-10783# Joint Publications Research Service, Arlington, Va.
EAST EUROPE REPORT: SCIENCE AND TECHNOLOGY
3 Aug. 1984 46 p refs Transl. into ENGLISH from various East European articles
(JPRS-ESA-84-029) Avail: NTIS HC A03/MF A01

Various topics in the areas of science and technology are discussed. Subject matter covered includes: (1) achievements in laser development; (2) methods and applications of image processing; (3) development of microcomputers in Hungary; and (4) lagging development of biotechnology. For individual titles, see N85-10784 through N85-10787.

N85-10784# Joint Publications Research Service, Arlington, Va.
ACHIEVEMENTS IN LASER DEVELOPMENT c36
Stefka Popova *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-84-029) 3 Aug. 1984 p 1-5 Transl. into ENGLISH from Pogled (Sofia), 18 Jun. 1984 p 1, 5 (For primary document see N85-10783 01-70)
Avail: NTIS HC A03/MF A01

Bulgarian achievements in laser development are discussed. Laser applications and production problems are also discussed. B.W.

N85-10785# Joint Publications Research Service, Arlington, Va.
METHODS, APPLICATIONS OF IMAGE PROCESSING c61
Miklos Hajal *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-84-029) 3 Aug. 1984 p 16-20 Transl. into ENGLISH from Szamitastech. (Budapest), no. 10, 1983 p 6-7 (For primary document see N85-10783 01-70)
Avail: NTIS HC A03/MF A01

Research dealing with form recognition and image processing has been carried out. Eight systems with various functions and of various designs for image processing are discussed. Practical applications of these devices have been carried out in medicine, robotics, biology and metal structure research. B.W.

N85-10786# Joint Publications Research Service, Arlington, Va.
MICROCOMPUTERS IN HUNGARY c60
Istvan Mezgar *In its* East Europe Rept.; Sci. and Technol. (JPRS-ESA-84-029) 3 Aug. 1984 p 21-29 refs Transl. into ENGLISH from Fiz. Szemle (Budapest), no. 9, 1983 p 336-341 (For primary document see N85-10783 01-70)
Avail: NTIS HC A03/MF A01

Microcomputers produced and designed in Hungary are discussed. Developmental trends in computer technology are also discussed. Domestic manufacture and cost factors are considered. B.W.

N85-10787# Joint Publications Research Service, Arlington, Va.
LAGGING DEVELOPMENT OF BIOTECHNOLOGY DESCRIBED c51
Bozena Kastory *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-84-029) 3 Aug. 1984 p 30-35 Transl. into ENGLISH from Zycie Warszawy (Warsaw), no. 4, 8 May 1984 p 3 (For primary document see N85-10783 01-70)
Avail: NTIS HC A03/MF A01

Poland's lagging development of biotechnology is described. Areas in which research could be best utilized include the pharmaceutical industry, chemical engineering and water pollution. Reasons are cited for this lag in development. B.W.

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution.*

N85-10788*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

OBSERVATIONS FROM VARYING THE LIFT AND DRAG INPUTS TO A NOISE PREDICTION METHOD FOR SUPERSONIC HELICAL TIP SPEED PROPELLERS
James H. Dittmar Sep. 1984 21 p refs
(NASA-TM-83797; E-2295; NAS 1.15:83797) Avail: NTIS HC A02/MF A01 CSCL 20A

Previous comparisons between calculated and measured supersonic helical tip speed propeller noise show them to have different trends of peak blade passing tone versus helical tip Mach number. It was postulated that improvements in this comparison could be made first by including the drag force terms in the prediction and then by reducing the blade lift terms at the tip to allow tne drag forces to dominate the noise prediction. Propeller hub to tip lift distributions were varied, but they did not yield sufficient change in the predicted lift noise to improve the comparison. This result indicates that some basic changes in the theory may be needed. In addition, the noise predicted by the drag forces did not exhibit the same curve shape as the measured data. So even if the drag force terms were to dominate, the trends with helical tip Mach number for theory and experiment would still not be the same. The effect of the blade shock wave pressure rise was approxmated by increasing the drag coefficient at the blade tip. Predictions using this shock wdave approximation did have a curve shape similar to the measured data. This result indicates that the shock pressure rise probably controls the noise at supersonic tip speed and that the linear prediction method can give the proper noise trend with Mach number. R.S.F.

N85-10789*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
HUMAN RESPONSE TO VIBROACOUSTIC ENVIRONMENTS OF SPACE VEHICLES
Kelli F. Willshire Oct. 1984 37 p refs Presented at the 108th Meeting of the Acoust. Soc. of Am., Minneapolis, 8-12 Oct. 1984
(NASA-TM-86316; NAS 1.15:86316) Avail: NTIS HC A03/MF A01 CSCL 05H

To insure efficient utilization of the system, space station design and operations will require special habitability considerations for the occupants and crew because of the relatively long duration missions. Of particular concern is the environment in which the personnel will live and work, and how it affects both the performance and comfort of the occupants. Current criteria do not consider possible effects of reduced gravity, long duration, and confinement. Preliminary to developing space station vibroacoustic habitability criteria, the adequacy of criteria for other space vehicles has been reviewed. In this paper, responses to the noise and vibration environments of both Skylab and Shuttle are discussed. Some astronauts have reported sleep interference, communication interference, distraction, and general annoyance as noise related complaints. In addition, information from the Russian Salyut missions, as well as similar based situtations (e.g., submarines), is reviewed. Author

N85-10790# Pierce (Allan D.), Marietta, Ga.
ANALYTICAL MODELING OF RANDOM THERMAL FLUCTUATIONS IN THE NORDA HIGH-FREQUENCY SOUND SCATTERING FACILITY Final Report
A. D. Pierce Jul. 1984 81 p
(Contract N00014-83-C-0260)
(AD-A145024; NORDA-TN-280) Avail: NTIS HC A05/MF A01 CSCL 20/1

An analytical study is presented of the laminar and turbulent flow fields that result from natural convetion created by cooled or heated arrays of tubular elements immersed in water. The study is concerned in particular with the methods used to create turbulence in the NORDA high-frequency sound scattering facility and many numerical results are given that pertain to that application. The report discusses the initially laminar thermal plume that rises from a line source of heat in water, the instability of this plume, the eventual turbulent form of the plume, plume-plume interactions, and the swaying of thermal plumes. An appendix gives a chronological bibliography of works on natural convention that may be pertinent to understanding of turbulent flows created in situations analogous to the NORDA high-frequency scattering facility. Key topics include buoyance, heat transfer, boundary layers, and instability. GRA

N85-10791# Texas Univ., Austin. Applied Research Lab.
NONLINEAR PROPAGATION IN A DEPTH-DEPENDENT OCEAN Annual Report, 1 Sep. 1982 - 30 Sep. 1983
C. L. Morfey 1 May 1984 1092 p
(Contract N00014-82-K-0805)
(AD-A145079; ARL-TR-84-11; AR-1) Avail: NTIS HC A05/MF A01 CSCL 20/1

The propagation of finite-amplitude sound in a depth-dependent ocean has been studied analytically and numerically, using a model based on weak-shock theory and the high frequency ray approximation. Results are presented for the equivalent propagation distance, in a uniform ocean, which reproduces the nonlinear distortion in the real situation. Numerical results for typical ocean properties are collapsed by means of an asymptotic theory, for ray paths along which the sound speed increases or decreases monotonically. Results are also shown for rays which form caustics. GRA

N85-10792# Department of Energy, Washington, D. C.
ACOUSTIC RESONATOR AND METHOD OF MAKING SAME Patent Application
Gerald R. Kline and K. M. Lakin, inventors (to DOE) Filed 13 Oct. 1983 14 p
(Contract W-7405-eng-82)
(DE84-014655; US-Patent-Appl-SN-541608) Avail: NTIS HC A02/MF A01

A method of fabricating an acustic wave resonator wherein all processing steps are accomplished from a single side of the substrate is disclosed. The method involves deposition of a multi-layered A1/A1N structure on a GaAs substrate followed by a series of fabrication steps to define a resonator from the composite. The resulting resonator comprises an A1N layer between two A1 layers and another layer of A1n on an exterior of one of the A1 layers. DOE

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N85-10793# Council for Scientific and Industrial Research, Faure (South Africa). National Accelerator Centre.
BEAM PULSE LENGTH DETERMINATION BY SPECTRAL ANALYSIS
P. G. Moteno, S. Schneider, and A. H. Botha 1983 26 p
(CSIF-NAC-83-05; ISBN-0-7988-2877-3) Avail: NTIS HC A03/MF A01

The feasibility of identifying the beam pulse length, for heavy ion beams down to 10 enA, by observing the amplitude of the Fourier components of the beam pulse train on commercially available UHF spectrum analyzers, is considered. Two cases are investigated: (1) the beam is destructively intercepted by a coaxial Faraday Cup (F.C.). The resulting electrical signal faithfully represents he beam current in the time domain. Further, max signal-to-noise ratio results from entire collection of the beam. (2) The beam induces a signal in a loosely coupled (approximately 1% of beam current) capacitive pick-up. The induced pulse train waveform is correspondingly altered, and signal-to-noise ratio deteriorates. Both cases are shown to be beyond the limits of practical spectrum analyzers for 10 enA beams, when 6 deg pulse widths are considered. Author

N85-10794# Council for Scientific and Industrial Research, Faure (South Africa).
CALIBRATION OF HALL PROBES
D. Bader 15 Sep. 1983 6 p

(CSIR-NAC-83-04; ISBN-0-7988-2874-9) Avail: NTIS HC A02/MF A01

Stability and basic properties of Hall plates allow reliable field measurements to an accuracy of 100 ppm, but a calibration over the whole interval of intended measurements is necessary since the Hall signal does not increase exactly linear with the applied field. The Hall plate is compared to a standard in the calibration magnet which is designed for the required stability and optimum field homogeneity in the central pole gap area. A nuclear magnetic resonance meter serves as standard showing the calibration field on an absolute scale from .1 T to 2 T with an accuracy of 2 ppm. The NMR probe and Hall plate must be located in the homogeneous region and see the same field. Secondly the Hall plate must be aligned perpendicular to the magnetic field, otherwise the signal is smaller according to the cosine of the tilt. The influence of the Planar Hall Effect is minor as long as the misalignment is only a few degrees. A minimum of 20 calibration data should be taken distributed over the field range the Hall plate will be used. Author

N85-10795# Council for Scientific and Industrial Research, Faure (South Africa).

INVESTIGATION OF CURRENT SETTING PROCEDURES FOR SECTOR MAGNETS

D. Bader 1983 7 p

(CSIR-NAC-83-03; ISBN-0-7988-2873-0) Avail: NTIS HC A02/MF A01

Because of the huge iron mass which must be magnetized when setting a field, it takes some time until the gap field settles. To cut the process down in time common practice is to overshoot the set level by a few percent. The results of the measurements to find the optimum excess and overshooting time obtained are gathered. Author

N85-10796# Council for Scientific and Industrial Research, Faure (South Africa).

FINAL MAGNETIC SHIMMING OF VACUUM CHAMBER SUSPENSION HOLES ON THE SECTOR MAGNETS

D. Bader and H. N. Jungwirth 1983 7 p

(CSIR-NAC-83-02; ISBN-0-7988-2876-5) Avail: NTIS HC A02/MF A01

Shimming of magnetic perturbations due to the vacuum chamber suspension holes in the pole faces was successful. The influence on orbits and phase slip caused by the remaining field deviations is negligible, since area and magnitude are very small. The field perturbations exhibit only very slight saturation effects up to a field level of B(sub o) = 1.25T, but the shims saturate some what faster than the plain holes. Author

N85-10797# Council for Scientific and Industrial Research, Faure (South Africa).

RESULTS OF PROTOTYPE FIELD MEASUREMENTS ON SM4

D. Bader and H. N. Jungwirth Jul. 1983 16 p

(NAC-83-01; ISBN-0-7988-2875-7) Avail: NTIS HC A02/MF A01

Magnetic design and performance of a sector magnet was checked and compared with the predictions. Excitation properties, azimuthal field shape at the edges, symmetry of leading and trailing edge and effective field edge were the subjects of this survey. All measurements are very close to the predicted values and the shift of the effective field edge, which is due to excitation dependent stray field variation, could be controlled by correlating the currents in main and additional coils. Author

N85-10798# National Aerospace Lab., Tokyo (Japan). First Aerodynamics Div.

MONTE CARLO SIMULATION OF THERMALIZATION OF SUBEXCITATION ELECTRONS IN MOLECULAR HYDROGEN

Katsuhisa Koura May 1984 13 p refs

(NAL-TR-815T; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

The Monte Carlo simulation of the thermalization of low-energy electrons due to rotationally inelastic and elastic collisions in normal H2 is extended to high-energy subexcitation electrons by taking into account vibrationally inelastic collisions and using available experimental cross section data. The electron velocity distribution deviates significantly from the Maxwell distribution (MD) even for the intial MD owing to vibrationally and rotationally inelastic collisions. Consequently, the degradation of the electron temperature is slower than that for the MD. The thermalization time is larger than that for the MD. R.S.F.

N85-10799# Naval Research Lab., Washington, D. C.

SANDYL RADIATION TRANSPORT CODE AT THE NAVAL RESEARCH LABORATORY Interim Report

J. B. Langworthy 25 Jul. 1984 21 p

(AD-A144890; AD-E000590; NRL-MR-5381) Avail: NTIS HC A02/MF A01 CSCL 18/8

SANDYL is a Monte Carlo photon and electron transport code used mainly to calculate dose in any material. This report is a history of the translation and modification of the local version, which is being run on the Texas Instrument Advanced Scientific Computer, and the report details how this version differs from the original versions. Together with original documentation, it will serve as a user's manual. Use of codes like SANDYL or of equivalent more expensive, experimental information is necessary in radiation vulnerability studies and hardness design work on Navy satellites. The special utility of SANDYL lies in its ability to handle rather general geometries while retaining a close connection with physical mechanism. GRA

N85-10800# Chemical Dynamics Corp., Columbus, Ohio.

COLLISIONAL EXCITATION CROSS SECTIONS Final Report, 15 Jun. 1982 - 15 Apr. 1984

M. J. Redmon, L. T. Redmon, and B. C. Garrett Aug. 1984 115 p

(Contract F04611-82-C-0041)

(AD-A145198; AFRPL-TR-84-030) Avail: NTIS HC A06/MF A01 CSCL 20/8

First principles calculations are reported of high velocity vibrational excitation and relaxation processes in several molecules of importance in plume technology. These involve collisions of atomic oxygen with HF, HCl, CO, water, and carbon dioxide. Cross sections for vibrational excitation and relaxation are reported, along with vibrational relaxation rate constants. The effect of chemical reaction channels in these systems is discussed, and is relatively unimportant except at the highest velocities considered. Translational energies were studied up to 6 eV. Author (GRA)

N85-10801# Department of Energy, Washington, D. C.

METHOD AND APPARATUS FOR DETERMINING THE CONTENT AND DISTRIBUTION OF A THERMAL NEUTRON ABSORBING MATERIAL IN AN OBJECT Patent Application

Thomas W. Crane, inventor (to DOE) Filed 21 Dec. 1983 19 p

(Contract W-7405-eng-36)

(DE84-014319; US-Patent-Appl-SN-564125) Avail: NTIS HC A02/MF A01

An apparatus and method for determining the content and distribution of a thermal neutron absorbing material within an object are disclosed. Neutrons having an energy higher than thermal neutrons are generated and thermalized. The thermal neutrons are detected and counted. The object is placed between the neutron generator and the neutron detector. The reduction in the neutron flux corresponds to the amount of thermal neutron absorbing material in the object. the object is advanced past the neutron generator and neutron detector to obtain neutron flux data for each segment of the object. The object may comprise a space reactor heat pipe and the thermal neutron absorbing material may comprise lithium. DOE

N85-10802# Ohio Univ., Athens.

STUDY OF STRUCTURE OF NUCLEI WITH NEUTRONS AND NUCLEAR DATA MEASUREMENTS FOR MFE Progress Report, 1 Dec. 1981 - 31 Jul. 1984

Raymond O. Lane and Steven M. Grimes 1984 211 p refs

(Contract DE-AC02-76ER-02490)

(DE84-015128; DOE/ER-02490/3) Avail: NTIS HC A10/MF A01

Measurements of cross sections for neutron-induced reactions of interest to the fusion energy program were carried out. These

measurements included neutron elastic and inelastic cross sections for Li-6, B-11, C-13, and O-18 as well as cross sections for Li-6 (n,t) (Alpha), Ni-13, (n,z), Ni-60 (n,z), and stainless steel (n,z) reactions. Most of these data were analyzed using either R-matrix studies or Hauser-Feshback calculations. Details of these measurements and analyses are given. Improvements to the facilities at this laboratory at Ohio University are also described. A shell model code was developed to aid in studies of nuclear structure and reaction mechanisms. The code is described and the structure and level density calculations now in progress are summarized. R.S.F.

N85-10803# California Univ., Berkeley. Lawrence Berkeley Lab. Accelerator and Fusion Research Div.
CONSIDERATIONS REGARDING THE CHOICE OF BEAM PARAMETERS AND IP CONFIGURATION FOR THE SSC
Christoph Leeman Jan. 1984 9 p refs Presented at the Workshop on Accelerator Phys. Issues for a Superconducting Super Collider, Ann Arbor, Mich., 12-16 Dec. 1983
(Contract DE-AC03-76SF-00098)
(DE84-014532; LBL-17805; CONF-831264-16) Avail: NTIS HC A02/MF A01

Beams consisting of closely spaced bunches, crossing at a small angle, represent the simplest way to achieve high luminosity with a moderate beam current and an acceptable peak event rate without resorting to the use of dipole magnets at, or very close, to the interaction point (IP). A procedure to derive beam parameters for this particular configuration is described. DOE

N85-10804# Brookhaven National Lab., Upton, N. Y.
HIGH ENERGY-RESOLUTION INELASTIC X-RAY SCATTERING
J. B. Hastings, D. E. Moncton, and Y. Fujii (Osaka Univ.) 1984 15 p refs Presented at Workshop on High Energy Excitations in Condensed Water, Los Alamos, N. Mex., 13 Feb. 1984
(Contract DE-AC02-76CH-00016)
(DE84-014565; BNL-34966; CONF-840264-6) Avail: NTIS HC A02/MF A01

A brief review is presented of various aspects of high energy-resolution inelastic X-ray scattering based on synchrotron sources. Kinematical advantages are provided by the photon probe and propose mirror and monochromator designs to achieve an optically efficient beam line for inelastic X-ray scattering. DOE

N85-10805# North Carolina Univ., Chapel Hill.
EXPERIMENTAL STUDIES OF ATOMIC INNER SHELL IONIZATION PHENOMENA Progress Report, 1 Aug. 1983 - 1 Jul. 1984
S. M. Shafroth 1984 36 p refs
(Contract DE-AS05-78ER-06027)
(DE84-013448; DOE/ER-06027/14; PR-5) Avail: NTIS HC A03/MF A01

The Si(11+) on He and Ar experiments over a wider energy range were investigated. The He data four points in the RTE region were taken with a different Si(Li) detector. This repeated examination serves as a check on the absolute cross sections at TUNL as compared to those measured at Brookhaven. DOE

N85-10806# Los Alamos Scientific Lab., N. Mex.
ACCELERATOR TECHNOLOGY PROGRAM Status Report, Jul. - Dec. 1982
R. A. Jameson, comp. May 1984 92 p refs
(Contract W-7405-eng-36)
(DE84-015052; LA-10118-SR) Avail: NTIS HC A05/MF A01

Highlights in beam dynamics, accelerator inertial fusion, radio frequency structure development, the racetrack microtron, CERN high energy physics experiment NA-12, and high flux radiographic linac study are reported. Selected proton Storage Ring activities and an update on the free electron laser are discussed. The fusion materials irradiation test facility work and progress on the klystron development project and on the gyrocon project are examined. The activities of the newly formed theory and simulation group are outlined. Activities concerning the accelerator test stand for the neutral particle beam program are outlined. DOE

N85-10807# Los Alamos Scientific Lab., N. Mex.
INFLUENCE OF 5f ELECTRONS ON STRUCTURES AND BONDING IN THE ACTINIDE-HYDROGEN INTERMETALLICS
John W. Ward 1984 14 p refs Presented at the EPS Topical Conf. on Electron. Structure and Properties of Rare Earth and Actinide Intermetallics, St. Polten, Austria, 3-6 Sep. 1984
(Contract W-7405-eng-36)
(DE84-013893; LA-UR-84-1794; CONF-8409102-2) Avail: NTIS HC A02/MF A01

Complexa phases for the Th + H and U + H systems not found in other metals are described. In the Pa + H system, simple bcc C15 Laves and A15 phases are formed. The phase transformations appear to be magnetically driven, as a result of the decoupling of the metallic 5f electron bonding which occurs during hydriding. A similar situation is obtained for A15 (BETA), UH3 structure. The parent metals exhibit electronegatives not unlike those of the mid 3d transition metals. Under the driving force for hydriding, the lattices open up, which decouples the f-bonding and induces magnetism. The systems forms very stable hydrides which is typical for high electropositive metals. Beyond uranium the trivalent metallic state is favored and rare earth like hydrides are found for Np + H and Pu + H. The solid state and transpot properties are markedly different from the rare earth hydrides, which show that the latent influence of the 5f electrons is still strong. DOE

N85-10808# California Univ., Berkeley. Lawrence Berkeley Lab. Nuclear Science Div.
THE BERKELEY MINI-COLLIDER
L. S. Schroeder Jun. 1984 11 p refs Presented at the Conf. on Intersect. between Particle and Nucl. Phys., Steamboat Springs, Colo., 23 May 1984
(Contract DE-AC03-76SF-00098)
(DE84-014594; LBL-17990; CONF-8405193-29) Avail: NTIS HC A02/MF A01

The Berkeley minicollider, a heavy ion collider which is planned to provide uranium uranium collisions at T/sub cm/ less than or equal to 4 GeV/nucleon is described. The central physics to be studied at these energies and early ideas for a collider detector are presented. DOE

N85-10809# Stanford Linear Accelerator Center, Calif.
METHODS TO INCREASE LINAC EFFICIENCY
Z. D. Farkas Apr. 1984 20 p refs
(Contract DE-AC03-76SF-00515)
(DE84-014692; SU-SLAC/AP-29) Avail: NTIS HC A02/MF A01

The average gradient of an accelerator section which is proportional to the average power entering the section during its filling time is discussed. The SLAC the gradient is one and two thirds the peak power. The linear collider requires a gradient of 21MV/m, hence 159 MW of peak power. Methods to increase the compression efficiency so that the 21 MV/m gradient can be reached with a minimum of RF peak power, of RF average power, and of ac line power are presented. The design of variable group velocity sections are discussed and it shows that by changing the group velocity gradient along the section, the variation of voltage with time can be used for beam loading compensation when the beam pulse width is less than the section filling time. DOE

N85-10810# Stanford Linear Accelerator Center, Calif.
LINAC QUADRUPOLE CONNECTIONS
Rae Stiening 12 Jul. 1984 3 p
(DE84-014694; SU-SLAC-CN-172-R1) Avail: NTIS HC A02/MF A01

Linac type QC and QCH quadrupoles were mounted on the accelerator with their power connection side facing the injector. The connections are on the top of the magnet. The correct polarity for magnets is shown. The magnetic centers of all magnets are measured. If the magnetic center is above the geometric center, the distance delta-y is positive. If the magnetic center is to the right of the geometric center, the distance delta-x is positive. DOE

N85-10811# Department of Energy, Chicago, Ill. Operations Office.
PROTON PUMPING IN PURPLE MEMBRANE, APPENDIX 1 Progress Report
1984 4 p refs
(Contract DE-AC02-82ER-12087)
(DE84-014601; DOE/ER-12087/T1-App-1) Avail: NTIS HC A02/MF A01

Research progress is reported on studies of the relationship between the structure of purple membrane, its light-activated conformational changes, and the physiological action of light - the creation of an energy gradient by the movement of protons across the cell membrane. DOE

N85-10812# Fermi National Accelerator Lab., Batavia, Ill.
HIGH INTENSITY HADRON ACCELERATORS
L. C. Teng Jun. 1984 16 p refs Presented at Conf. on the Intersections between Particle and Nucl. Phys., Steamboat Springs, Colo., 23 May 1984
(Contract DE-AC02-76CH-03000)
(DE84-014063; FERMILAB/TM-1262; CONF-8405193-17) Avail: NTIS HC A02/MF A01

An introductory discussion of high intensity hadron accelerators with special emphasis on the high intensity feature is given. The topics selected for this discussion are: types of accelerators; focusing; intensity limitations; power economics; and heavy ion kinematics. DOE

N85-10813# Argonne National Lab., Ill.
SEARCHING FOR TOP, HIGGS, AND SUPERSYMMETRY: THE MINIMUM INVARIANT MASS TECHNIQUE
Edmond L. Berger 5 Mar. 1984 15 p refs Presented at the 16th Rencontre de Moriond, La Plagne, France, Mar. 1984 Prepared in cooperation with European Organization for Nuclear Research
(Contract W-31-109-eng-38)
(DE84-014539; ANL-HEP-CP-84-18; CONF-8403131-5) Avail: NTIS HC A02/MF A01

Supersymmetric particles, Higgs mesons, the top quark, and other heavy objects are expected to decay frequently into three or more body final states in which at least one particle, such a neutrino or photino, is noninteracting. A method is described for obtaining an excellent estimate of both the mass and the longitudinal momentum of the parent state. The probable longitudinal momenta of the noninteracting particle and of the parent, and the minimum invariant mass of the parent, are derived from a minimization procedure. The distributions in these variables are shown to peak sharply at their true values. DOE

N85-10814# Physikalisch-Technische Bundesanstalt, Brunswick (West Germany). Gruppe fuer Photonen- und Elektronendosimeterie.
PHOTON AND ELECTRON DOSIMETRY AT THE PHYSIKALISCHE-TECHNISCHE BUNDESANSTALT IN BRUNSWICK
Herbert Reich Dec. 1983 35 p refs Lectures held at Beijing, China, Apr. 1983
(PTB-Dos-9; ISSN-0172-7095) Avail: NTIS HC A03/MF A01

Photon and electron dosimetry equipment and procedures are described. Radiation sources; primary standards for photon radiation in air; ionization chamber standards for water phantoms; chemical dosimetry; absolute determination of absorbed dose; type testing chambers and measuring assemblies; radiation protection dosimetry; calibrating for hospitals and secondary standards dosimetry laboratories; and beta ray dosimetry are discussed. Author (ESA)

N85-10815# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
MEASUREMENT OF MAGNETIC SUBLEVEL DIFFERENTIAL SCATTERING CROSS SECTIONS FOR POTASSIUM AND MERCURY Thesis [MESSUNG DIFFERENTIELLER STREUQUERSCHNITTE FUER DIE ANREGUNG MAGNETISCHER UNTERNIVEAUS BEI STOESSEN VON KALIUM MIT QUECKSILBER]
U. Krause Oct. 1983 116 p refs In GERMAN
(MPIS-10/1983; ISSN-0436-1199) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 20,50

Results of a particle-photon coincidence experiment are reported. Electronic excitation was produced in the collision between a potassium beam and a mercury target with a collision energy of 167 eV. The excited states were specified using spectral analysis of the emitted light. The polarizations of the light scattering cross sections for fine structure states 2P 3/2, 3P 1/2 and magnetic substates of 2P 3/2 are presented. Author (ESA)

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N85-10816# Council for Scientific and Industrial Research, Faure (South Africa). National Accelerator Centre.
NOTES ON NAC REPORT NAC-83-08: BEAM PULSE LENGTH DETERMINATION BY SPECTRAL ANALYSIS
P. G. Molteno 1983 6 p
(CSIR-NAC-83-06; ISBN-0-7988-2878-1) Avail: NTIS HC A02/MF A01

Inference of beam pulse length by spectral analysis is proposed owing to its opening the door to noise reduction by narrow band heterodyne techniques. The method rests on identification of the first null in the frequency spectrum, and thence determining the pulse width. The calculated Fourier series of these modeled pulse trains, and the observed spectra of such pulse trains when crudely synthesized by a RF pulse generator and applied to a spectrum analyzer, are presented and discussed. Author

N85-10817# Brown Univ., Providence, R. I. Dept. of Physics.
RESEARCH PROGRAM IN THEORETICAL HIGH-ENERGY PHYSICS Progress Report
D. Feldman, H. M. Fried, A. Jevicki, K. Kang, and C. I. Tan 30 Jun. 1984 19 p refs
(Contract DE-AC02-76ER-03130)
(DE84-013717; DOE/ER-03130/366; COO-313-TA-366) Avail: NTIS HC A02/MF A01

Results were reached in: geometric structures of symmetry breaking relevant differential forms and cohomology theory; continuum strong coupling methods; fermions in quenched and non-quenched approximations field theory theoretical methods for fluid dynamics; dynamical SUSY breaking; non-Abelian monopoles in Kaluza-Klein theories; dual, non-linear sigma models in supergravity; skyrmions; grand unification models; naturalness criteria and color anomalies; multiple fermion generations; the mass hierarchy problem; axion implications for cosmology; anomalies and anomly-free representations of gauge theories; a field theoretic explanation of the quantum Hall effect, localization, and two-dimensional electron gases; chirally invariant lattice gauge theories, and the unacceptability of the SLAC model; axial anomalies in compact manifolds with boundary conditions; simulation of Weyl fermion theories; quantum lattice theories; phase transitions in a variety of lattice gauge theories; polarized photon structure functions; Monte Carlo estimates of hadronic masses and numerical studies of Gribov gauge ambituities; Hamiltonian quantization of an SL(2,C) gauge theory; variational approach to lattice ground states; and lattice QCD surfaces in the large-N limit. DOE

74 OPTICS

Includes light phenomena.

N85-10818 Department of the Air Force, Washington, D.C.
ENVIRONMENTALLY INDEPENDENT FIBER OPTIC ROTATION

SENSOR Patent
H. J. Shaw and H. J. Arditty, inventors (to Air Force) Issued 24 Jul. 1984 7 p Supersedes AD-D008637
(AD-D011219; US-Patent-4,461,574; US-Patent-Appl-SN-105043; US-Patent-Class-356-350) Avail: US Patent and Trademark Office CSCL 20/6

Document describes an environmentally independent fiber optic rotation sensor having a polarizer or polarization filter interposed between each beam coupler and the beamsplitter of the rotation sensor. The polarizers permit the passing of the polarization of the beams therethrough while rejecting the cross-polarized waves of the beams thereby causing a co-polarized mode of operation to take place. As a result of the co-polarized mode of operation the rotation sensor is unaffected by the surrounding environmental conditions. However, in so doing, the rotation sensor is subject to spurious fringe patterns which take place at the fiber ends. Elimination of these fringe patterns take place at the input side of the rotation sensor rather than at the output side in order to produce satisfactory rotation sensing. Author (GRA)

N85-10819*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
OPTICAL CONTACTING FOR GRAVITY PROBE STAR TRACKER
J. J. Wright and D. E. Zissa Oct. 1984 14 p refs
(NASA-TM-86475; NAS 1.15:86475) Avail: NTIS HC A02/MF A01 CSCL 20F

A star-tracker telescope, constructed entirely of fused silica elements optically contacted together, has been proposed to provide submilliarc-second pointing accuracy for Gravity Probe. A bibliography and discussion on optical contacting (the bonding of very flat, highly polished surfaces without the use of adhesives) are presented. Then results from preliminary experiments on the strength of optical contacts including a tensile strength test in liquid helium are discussed. Suggestions are made for further study to verify an optical contacting method for the Gravity Probe star-tracker telescope. Author

N85-10820# Army Engineer Topographic Labs., Wright-Patterson AFB, Ohio.
MIDDLE INFRARED SPECTRAL STUDIES OF GEOLOGIC MATERIALS IN THEIR NATURAL STATE USING PHOTOTHERMAL BEAM DEFLECTION SPECTROSCOPY
J. W. Eastes and M. J. D. Low Apr. 1984 11 p Presented at the 3rd Intern. Symp., Remote Sensing of Environ., Colorado Springs, 16-19 Apr. 1984
(AD-A144894; ETL-R-064) Avail: NTIS HC A02/MF A01 CSCL 20/6

The use of a novel laboratory spectral technique is described for the recording of middle infrared (MIR) absorption spectra of natural surfaces with no sample preparation. Such a technique allows evaluation of spectral influences of surficial films such as weathering products, lichen cover or desert varnish on the spectra of the substrate geologic materials. In remote sensing applications the technique should provide spectral information more nearly representative of field conditions and may improve interpretation of thermal imagery. The technique, called photothermal beam deflection spectroscopy (PBDS) was originally developed for studies of surface chemistry in situations where it is impractical or impossible to separate surface layers from their substrate. In the present studies the spectral characteristics of natural rock and mineral surfaces have been examined. GRA

N85-10821# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE DEVELOPMENT OF AN OPTOELECTRONIC ASSEMBLY APPLIED TO COMPUTER SYSTEMS
L. Xiangzhen, C. Ruchuan, and L. Yunguo 9 Aug. 1984 16 p Transl. into ENGLISH from Dianzi Jishu Yingyong (China), no. 10, 1983 p 19-22
(AD-A145028; AD-E401205; FTD-ID(RS)T-0858-84) Avail: NTIS HC A02/MF A01 CSCL 20/6

The development of a fiber optic transmission system for interprocessor communication is described which is characterized by a 8.448 Mb/s data rate and is operable over a distance of 1000 m. The optoelectronic assembly consists of a light emitter, its LED driver, and a p-i-n diode based receiver. Each of these components are described along with some transmission experiments. M.G.

N85-10822# Department of the Army, Washington, D. C.
MOVING OBJECT DETECTION SYSTEM USING INFRARED SCANNING Patent Application
H. Pardes and W. J. Mills, inventors (to Army) Filed 9 Aug. 1984 15 p
(AD-D011222; US-Patent-Appl-SN-639054) Avail: NTIS HC A02/MF A01 CSCL 17/5

An infrared moving object detection system comprising first and second infrared detectors and an optical scanning system mounted in an aircraft for scanning along first and second paths on the ground, with the detectors receiving infrared radiation from objects in the two paths. One path is a small angle ahead of the aircraft, and the second path is the same as the first path when the aircraft is directly above it. Electronic circuit means compares the infrared information in the two paths to determine whether hot objects are in the same place in both paths, and, if they are not, it is known that one or more objects are moving objects.GRA

N85-10823# Department of the Air Force, Washington, D.C.
METHOD FOR MEASURING HAZE IN TRANSPARENCIES Patent Application
H. L. Task, inventor (to Air Force) Filed 22 Jun. 1984 32 p
(AD-D011233; US-Patent-Appl-SN-623667) Avail: NTIS HC A03/MF A01 CSCL 20/6

A method of measuring haze in a transparency includes the steps of illuminating a transparency to be measured from one side using a semi-collimated light source disposed in a predetermined angular relationship to the transparency, measuring the illumination (E) falling on a surface of the transparency from the one side thereof, then along a predetermined line of measurement through the transpoarency using a photometer to measure the veiling luminance (L) within the transparency from another side thereof, and, finally, calculating the haze index of the transparency by solving H(i) = L/E. Author (GRA)

N85-10824# Department of Energy, Washington, D. C.
OPTICAL PIN APPARATUS FOR MEASURING THE ARRIVAL TIME AND VELOCITY OF SHOCK WAVES AND PARTICLES Patent Application
Robert F. Benjamin, inventor (to DOE) Filed 18 Oct. 1983 16 p
(Contract W-7405-eng-36)
(DE84-014501; US-Patent-Appl-SN-542958) Avail: NTIS HC A02/MF A01

An apparatus for detecting the arrival of and for determining the velocity of disturbances such as shock-wave fronts and/or projectiles is disclosed. Optical pins using fluid-filled microballoons as the light source and an optical fiber as a link to a photodetector were used to investigate shock-waves and projectiles. A microballoon filled with a noble gas is affixed to one end of a fiber-optic cable, and the other end of the cable is attached to a high-speed streak camera. As the shock-front or projectile compresses the microballoon, the gas inside is heated and compressed producing a bright flash of light. The flash of light is transmitted via the optic cable to the streak camera where it is recorded. One image-converter streak camera is capable of recording information from more than 100 microballoon-cable combinations simultaneously. DOE

N85-10825# York Coll., Jamaica, N. Y.
FINE GRAINED HODOSCOPES BASED ON SCINTILLATING OPTICAL FIBERS Final Technical Report, 1 Jun. 1983- 31 May 1984
Samuel R. Borenstein 31 May 1984 42 p refs

(Contract DE-AC02-8134-40035)
(DE84-014849; DOE/ER-40035/T1) Avail: NTIS HC A03/MF A01

Scintillating optical fibers were developed and tested for use in a fine grained hodoscope for experiments in high energy physics. The need for such a device in experiments in high rate environments is discussed and the process of drawing and cladding a plastic scintillator to form scintillating optical fibers is described. The test procedures used to evaluate the resultant fibers both in the laboratory and at the accelerator are given. Three possible readout schemes individual photomultiplier tubes, avalanche photodiodes, and microchannel plates with segmented anodes are considered. The results of this study are then presented. The present status of the project is summarized, in which it is pointed out that significant improvement in useful fiber length was achieved. The difficulty of quality control in fiber production remains a serious limitation, and a satisfactory readout scheme with good optical coupling between many hodoscope elements and photodetectors is not yet achieved. R.S.F.

N85-10826# Physics Lab. RVO-TNO, The Hague (Netherlands). Researchgroep 2: Far Infrared.
DESCRIPTION OF THE DUTCH-DANISH (DUDA) SCANNER
A. N. deJong May 1984 43 p refs Original contains color illustrations
(AD-B084893; PHL-1984-39; TDCK-79366) Avail: NTIS HC A03/MF A01

An instrument to gather quantitative infrared signatures was developed. The total field of view of 3 deg horizontal x 15 deg vertical is scanned in 4 sec, simultaneously with a 5 and 10 micron detector. With the instantaneous field of view of 1 mrad a noise equivalent temperature difference of 0.1 k and 0.03 k is achieved. The signals can be recorded analogically, digitally on diskette or computer compatible tape. A television format display system was also developed. Author (ESA)

N85-10827# National Bureau of Standards, Washington, D.C. Center for Manufacturing Engineering.
METROLOGICAL CONSEQUENCES OF THE HARD OPTICAL BOUNDARY ASSUMPTION Final Report
A. George Lieberman Jul. 1984 31 p refs
(PB84-223577; NBS-TN-1198) Avail: NTIS HC A03/MF A01; also available SOD CSCL 20F

The reflection of s-polarized light propagating in vacuum by a metal surface is examined for two descriptions of the vacuum-metal interface; the exponential surface transition and the Lang-Kohn transition. Both models treat the metal as a lossless, non-magnetic jellium material, but differ in spatial distributions of their constituent charges. The displacement of the optical surface relative to the mechanical surface caused by the transition is evaluated for each model. Computerized results are presented for the optical displacement and phase change upon reflection from a sodium surface for the theoretically superior Lang-Kohn model. The measurement errors which result from ignoring the vacuum-metal transition become more significant as the angle of incidence is increased. GRA

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N85-10828 Max-Planck-Inst. fuer Plasmaphysik, Garching (West Germany).
FLUCTUATION SPECTRUM FOR LINEAR GYROVISCOUS MHD
I. L. Caldas (Sao Paulo Univ., Brazil) and H. Tasso May 1984 11 p refs Sponsored by Fundacao de Amparo a Pesquisa do Estado de Sao Paolo
(IPP-6/237) Copyright. Avail: Issuing Activity

A general formalism for obtaining the fluctuation spectrum of plasmas and fluids in statistical equilibrium, which is valid for linearized equations of conservative systems in a heat bath which allows the use of Gibbs statistics, was applied to gyroviscous one-fluid homogeneous plasmas. Results show that gyroviscosity does not help to remove ultraviolet divergences. For a subclass of observables it does not even show up. The full nonlinear problem may be needed. Author (ESA)

N85-10829# Naval Research Lab., Washington, D. C.
MHD INSTABILITIES IN SIMPLE PLASMA CONFIGURATION
W. M. Manheimer and C. Lashmore-Davies 1984 107 p
(AD-A144936) Avail: NTIS HC A06/MF A01 CSCL 20/9

This work provides what, we hope, is a relatively simple, self contained description of MHD instabilities in plasmas with simple configurations. By simple configuration, we mean a plasma in which all quantities vary in only one spatial direction. We deal with such plasmas here because we want to emphasize the basic physics of MHD instabilities. Although some fusion devices are inherently two or three dimensional in nature, there are others, specifically Tokamaks and reversed field pinches which are, to good approximation, one dimensional. Also, these devices both display a wealth of complex MHD activity which can be fruitfully discussed. One deceptive aspect of MHD instabilities is that the simplest ones are extremely easy to understand. However more complicated instabilities, for instance in a plasma where both an axial and azimuthal field are present are much more difficult to visualize; but they are also much more interesting. This work is divided into two parts. Chapters 2-9 describe linear theory and chapters 10-15 describe the nonlinear theory. The latter part is naturally much more speculative than the former because less is known about nonlinear theory. GRA

N85-10830# Naval Research Lab., Washington, D. C.
A COVARIANT DERIVATION OF THE PONDEROMOTIVE FORCE Memorandum Report, Oct. 1983 - Sep. 1984
W. M. Manheimer 9 Aug. 1984 22 p
(AD-A145054; NRL-MR-5404) Avail: NTIS HC A02/MF A01 CSCL 20/9

A derivation of the ponderomotive force for an unmagnetized or a uniformly magnetized particle is given here. By using a convariant form of the equations of motion, a very simple result is obtained. Evaluation of the final result is particularly simple since any four vector scalar product can be evaluated in the rest or ponderomotive frame. Examples are given for free electron laser applications. Author (GRA)

N85-10831# Naval Research Lab., Washington, D. C.
K-SHELL YIELD SCALING LAW FOR CONVENTIONAL PRS LOADS
J. P. Apruzese and J. Davis 31 Aug. 1984 22 p
(AD-A145155; NRL-MR-5406) Avail: NTIS HC A02/MF A01 CSCL 20/9

The simplified equation of motion for a Z-pinch implosion is combined with an empirical scaling law for K-shell yield as a function of temperature and denisty, and also with power law fits to K-shell atomic data to predict K-shell yields as a function of atomic number and generator power. Assuming the efficiency of future machines to approximate that of existing generators leads to the conclusion that argon will be a prolific PRS with generator powers of approx. = 25 TW while titanium will require approx. = 40 TW. Conventional iron and krypton loads will require generators in the 50-100 TW range to be efficient K-shell radiators. Author (GRA)

N85-10832# Department of Energy, Washington, D. C.
HOT HOLLOW CATHODE GUN ASSEMBLY Patent Application
Joseph D. Zeren, inventor (to DOE) Filed 22 Nov. 1983 16 p
(Contract DE-AC04-76DP-03533)
(DE84-014312; US-Patent-Appl-SN-554414) Avail: NTIS HC A02/MF A01

A hot hollow cathode deposition gun assembly is disclosed. The device includes a hollow body having a cylindrical outer surface

and an end plate for holding an adjustable heat sink, the hot hollow cathode gun, two magnets for steering the plasma from the gun into a crucible on the heat sink, and a shutter for selectively covering and uncovering the crucible. DOE

N85-10833# Illinois Fusion Power Task Force, Springfield. Governor's Commission of Science and Technology.
FUSION AND ITS FUTURE IN ILLINOIS
C. C. Baker, comp. Aug. 1984 33 p refs
(Contract DE-W-31-109-eng-38)
(DE84-014686; DOE/NBM-4014686) Avail: NTIS HC A03/MF A01

The current status and predicted progress of fusion energy technology in Illinois are assessed. An explanation of basic fusion concepts as well as a summary of national and international programs are included. Environmental, safety, and economic factors are also considered. M.A.C.

N85-10834# Wisconsin Univ., Madison. Dept. of Physics.
EXPERIMENTAL OBSERVATION OF NEOCLASSICAL CURRENTS Ph.D. Thesis
M. C. Zarnstorff Jun. 1984 73 p refs
(Contract DE-AC02-83ER-53154)
(DE84-015113; DOE/ER-53154/67) Avail: NTIS HC A04/MF A01

The parallel and perpendicular equilibrium currents were experimentally studied in the Levitated Octupole, with toroidal field. Observations of the spatial structure, collisionality and toroidal field dependence of the complete current and the ion portion of the current are presented. Experimentally measured currents are compared to neoclassical current distributions calculated for the actual machine geometry. Measurements of the total plasma parallel current for absolute-MHD-stable flux surfaces (inside the separatrix) agree well with theory, showing the bootstrap and Pfirsch-Schlueter currents as predicted by neoclassical transport theory. On average-MHD-stable flux surfaces (outside the separatrix) there is more parallel current than predicted by theory, though the spatial structure is correct. Separate measurements of the ion parallel and perpendicular currents agree with theory, showing the lack of measurable ion poloidal rotation in all situations. DOE

N85-10835# Mathematical Sciences Northwest, Inc., Bellevue, Wash.
KrCl LASERS FOR FUSION Final Report
31 May 1984 45 p refs
(Contract DE-AC08-81DP-40169)
(DE84-012210; DOE/DP-40169/T1) Avail: NTIS HC A03/MF A01

The lasing characteristics of the Krypton Chloride excimer are investigated in an e-beam laser facility. The results of experiments are compared with the predictions of a comprehensive numerical kinetics model. The model predicts that the formation efficiency for KrCl* should be quite high (approx. = 20%) and these predictions are borne out by experimental gain measurements. Observed intrinsic laser efficiencies are poor, about 1 percent being the best observed in this program. The poor lasing performance results from an adverse gain to loss ratio and an extreme sensitivity to optics losses because of the low characteristics magnitude of the gain. DOE

N85-10836# GA Technologies, Inc., San Diego, Calif.
MEANS OF VARYING CONDITIONS IN THE EXPANDED BOUNDARY DIVERTOR WITHOUT AFFECTING ENERGY CONFINEMENT
K. R. Burrell, N. Ohyabu, R. Chase, C. Kahn, and T. Petrie May 1984 21 p refs Presented at 6th Intern. Conf. on Plasma Surface Interactions in Controlled Fusion Devices, Nagoya, Japan, 14 May 1984
(Contract DE-AT03-84ER-51044)
(DE84-013840; GA-A-17557; CONF-840520-13) Avail: NTIS HC A02/MF A01

Expanded boundary divertor discharges in Doublet III have shown a significant enhancement in confinement relative to limiter discharges with similar plasma density, current, toroidal field and neutral beam heating power. This improvement is insensitive to divertor density, recycling rate and power radiated from the divertor. Accordingly, it may be possible to exploit the improved divertor confinement in a fusion reactor while independently adjusting conditions in the divertor to satisfy reactor engineering constraints. DOE

N85-10837# National Bureau of Standards, Boulder, Colo. Fracture and Deformation Div.
MATERIALS STUDIES FOR MAGNETIC FUSION ENERGY APPLICATIONS AT LOW TEMPERATURES, 7
R. P. Reed, ed. and N. J. Simon, ed. May 1984 415 p refs Sponsored in part by DOE
(DE84-013487; NBSIR-84-3000) Avail: NTIS HC A18/MF A01

Work leading toward development of strong, tough structural alloys for use in superconducting magnets of magnetic fusion power plants is reported. Low temperature studies were conducted to assess the quantitative dependence of the yield strength, density, and elastic constants of AISI 304 stainless steels upon carbon and nitrogen concentration. Tensile property measurements of developmental austenitic steels confirmed the dependence of yield strength upon temperature. Evidence is presented to show that the flow strength and austenite stability of stainless steels are not significantly affected by 8-T fields at 4 K. Instrumentation developed for low temperature testing included a computer assisted apparatus used to measure threshold fatigue. Low temperature welding research involved an investigation of the weld reinforcement effect on the weld joint strength and measurements of the 4 K fracture toughness of magnesium-chromium steel weldments and electroodes. In the area of non-metallics, a standardized test specimen was devised to aid in screening radiation-resistant composites for magnet insulation. Mechanical properties of concrete mortar and polyurethane foam at 4 K are reported. R.S.F.

N85-10838# Wisconsin Univ., Madison. Dept. of Physics.
POLARIZED ELECTRON CYCLOTRON EMISSION IN THE TOKAPOLE 2 TOKAMAK
M. A. Sengstacke, R. N. Dexter, and S. C. Prager Jun. 1984 19 p refs
(Contract DE-AC02-76ET-53051)
(DE84-014953; DOE/ET-53051/68) Avail: NTIS HC A02/MF A01

The effect of wall reflections was examind by measuring the polarization of second harmonic cyclotron emission (at omega = 2 omega/sub ce/) in the Tokapole II Tokamak both with and without a microwave absorber installed within the field of view of the receiving antenna. It is found that the local elimination of wall reflections markedly enhances the polarization. Observations consistent with right hand cutoff effects and an attemp to infer the electron temperature from cyclotron emission in an optically thin plasma are described. DOE

N85-10839# Language Services, Nashville, Tenn.
PLASMA DRIFT EQUILIBRIUM (GYRATION) IN TOROIDAL SYSTEMS WITH COMPLEX MAGNETIC-FIELD GEOMETRY
A. B. Mikhailovskii and V. S. Tsypin 16 Aug. 1984 24 p refs Transl. into ENGLISH of "Plazmy v Toroidalnykh Sistemakh so Slozhnoi Geometriei Magnitnogo Polya" rept. IAE-3730/6 I. V. Kurchatov Inst. of Atomic Energy, Moscow, 1983 p 1-21
(Contract DE-AC05-84OR-21400)
(DE84-015627; ORNL-tr-5146; IAE-3730/6) Avail: NTIS HC A02/MF A01

Plasma gyration in toroidal systems was studied theoretically. Allowance is made for the dependence of the curvature of the magnetic axis on the longitudinal coordinate, and for the magnetic-field corrugation. The aspect ratio is assumed large, and the magnetic surfaces round. General equations are derived for the relaxation of poloidal and toroidal velocities. These equations are analyzed for the frequent-collision regime (the Pfirsch-Schlueter regime). It is shown that the relaxation due to longitudinal viscosity sets up equilibrium with zero toroidal velocity in corrugated toroidal systems. A general formula is derived for the poloidal velocity in

the Pfirsch-Schlueter regime. As in the case of a Tokamak, this velocity is proportional to the ion temperature gradient and is independent of both the density radient and the radial electric field. DOE

N85-10840# Los Alamos Scientific Lab., N. Mex.
TWO NOVEL PLASMA DIAGNOSTIC TOOLS: FIBER SENSORS AND PHASE CONJUGATION
F. C. Jahoda 1984 26 p refs Presented at Intern. Conf. on Plasma Phys., Lausanne, Switzerland, 27 Jun. 1984
(Contract W-7405-eng-36)
(DE84-014033; LA-UR-84-1976) Avail: NTIS HC A03/MF A01

A rapidly developing technology (single-mode optical fiber sensors) and recent fundamental research in nonlinear optics (phase conjugation) both offer opportunities for novel plasma diagnostics. Single-mode fiber sensors can replace electrical wire probes for current and magnetic field measurements with advantages in voltage insulation requirements, electromagnetic noise immunity, much greater bandwidth, and some configuration flexibility. Faraday rotation measurements through fibers wound on the ZT-40M REF demonstrated quantitative results, but competing linear birefringence effects still hinder independent interpretation. Optical phase conjugation (in which a phase reversed copy of a laser beam is generated) allows real time distortion corrections in laser diagnostics. Self-pumped phase conjugation in BaTiO3 improves the quality of phase conjugation imagery and greatly simplifies experimentation directed toward plasma diagnostics. Initial applications are time-differential refractometry with high spatial resolution and intracavity absorption Zeeman spectroscopy. DOE

N85-10841# California Univ., Irvine. Dept. of Physics.
FAST WAVES NEAR THE LOWER HYBRID FREQUENCY Final Contract Report
R. McWilliams 1984 11 p refs
(Contract DE-AT03-82ER-53135)
(DE84-015217; DOE/ER-53135/T1) Avail: NTIS HC A02/MF A01

The theory of fast waves near the lower hybrid frequency is studied. Special emphasis is given to aspects which assist experimentalists in planning and performing experiments to test the feasibility of using the fast wave for plasma heating and current drive. Evanescent and propagating conditions for the wave are determined. Possible antennas for launching the waves are determined. Coupling coefficients of the waves into the plasma are found. The results are applied to present day and reactor grade plasma parameters. DOE

N85-10842# California Univ., Los Angeles. School of Engineering and Applied Science.
PLASMA SURFACE INTERACTIONS IN MAGNETIC FUSION SYSTEMS Annual Progress Report
R. W. Conn and A. K. Prinja Jul. 1984 7 p refs
(Contract DE-AT03-80ER-52062)
(DE84-015255; DOE/ER-52062/T5) Avail: NTIS HC A02/MF A01

Brief summaries of major accomplishments were given for the following areas: (1) Tokamak edge plasma theory and modeling; (2) tandem mirror edge plasma theory and modeling; and (3) neutral atom transport in plasmas. DOE

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N85-10843*# National Aeronautics and Space Administration, Washington, D. C.
CONVERSION OF MICROWAVE SIGNALS BY SUPERCONDUCTING FILMS IN THE RESISTIVE STATE
I. I. Yeru, S. A. Peskovatskiy, and V. S. Sulima Aug. 1984 28 p refs Transl. into ENGLISH of "Preobrazovaniye signalov SVCh sverkhprovodnikovymi plenkami v rezistivnom sostoyanii" rept. Pr-156 Kharkov, 1980 35 p Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Inst. of Radiophysics and Electronics, Academy of Sciences of the Ukrainian SSR, Kharkhov
(Contract NASw-3541)
(NASA-TM-77595; NAS 1.15:77595; PR-156) Avail: NTIS HC A03/MF A01 CSCL 20L

The main characteristics of a superconducting thin film microwave mixer, i.e., conversion efficiency and bandwidth are analyzed. The optimum operating regime of the nonlinear element is determined. Results of calculations are compared with the experimental ones. Experimental data on the noise in the superconducting films in a wide frequency range are presented. Author

N85-10844*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PLASMA DEPOSITED DIAMONDLIKE CARBON ON GaAs AND InP
J. D. Warner, J. J. Pouch, S. A. Alterovitz, D. C. Liu, and W. A. Lanford (State Univ. of New York, Albany) 1984 15 p refs Proposed for presentation at the 31st Natl. Symp. of the Am. Vacuum Soc., Reno, Nev., 3-7 Dec. 1984
(NASA-TM-86870; E-2332; NAS 1.15:86870) Avail: NTIS HC A02/MF A01 CSCL 20L

The properties of diamond like carbon films grown by RF flow discharge 30 kHz plasma using methane are reported. The Cls XPS line shape of films showed localized hybrid carbon bonds as low as 40 to as high as 95 percent. Infrared spectroscopy and N(15) nuclear reaction profiling data indicated 35 to 42 percent hydrogen, depending inversely on deposition temperature. The deposition rate of films of Si falls off exponentially with substrate temperature, and nucleation does not occur above 200 C and GaAs and InP. Optical data of the films showed bandgap values of 2.0 to 2.4 eV increasing monotonically with CH4 flow rate. Author

N85-10845# Rome Air Development Center, Griffiss AFB, N.Y.
ENERGY DEPOSITION IN MICROVOLUMES OF SILICON FROM HIGH ENERGY PROTON REACTIONS
J. N. Bradford 1 Feb. 1984 26 p
(AF Proj. 2306)
(AD-A144713; RADC-TR-84-5) Avail: NTIS HC A03/MF A01 CSCL 20/12

Energy deposition by reaction secondaries issuing from high energy proton-silicon nucleus reactions is calculated. The basis of the calculation formalism is geometrical probability and follows from a direct analogue in radiobiology. Chord length (Track Segment Length), differential, and integral energy deposition distribution functions are calculated along with the first two moments of the distributions. The results enable description of energy deposition in microvolumes of silicon, for example, microelectronic memory cells. Author (GRA)

N85-10846# North Carolina Univ., Chapel Hill. Dept. of Chemistry.
PREPARATION AND PROPERTIES OF SINGLE CRYSTALS OF HYDROGEN BIS(PHTHALOCYANINATO) NEODYMIUM(3)
B. W. Sullivan, R. N. Dominey, J. H. Helms, M. Schwartz, and L. W. ter Haar 15 Aug. 1984 8 p
(Contract N00014-76-C-0816)
(AD-A144933; TR-23) Avail: NTIS HC A02/MF A01 CSCL 07/2

Partially oxidized metallomacrocycles yield low-dimensional conducting materials. For example, NiPcI (Pc = phthalocyanine) crystallizes with the formation of stacked, planar NiPc units and exhibits metal-like conductivity parallel to the stacking direction. Lanthanide elements form sandwich-type compounds with phthalocyanine. In this paper, we report the electrochemical synthesis, electrical conductivity, and magnetic behavior of single crystals of bis(c)Nd(III). GRA

N85-10847# Midwest Research Inst., Golden, Colo.
CHEMICAL VAPOR DEPOSITION OF AMORPHOUS SILICON FILMS PRODUCED BY USING HIGHER ORDER SILANES
A. Mikhail, J. Dick, and W. Carlos May 1984 28 p refs
(Contract DE-AC02-83CH-10093)
(DE84-004519; SERI/TR-211-2229) Avail: NTIS HC A03/MF A01

Various chemical vapor deposition (CVD) techniques performed in the area of chemical capor deposition of hydrogenated amorphous silicon by using higher order silanes are discussed. The static CVD system was found to produce films with nonuniform stoichiometry. All flow systems were capable of depositing films that produced a short-circuit current density of 10 mA/cm(2). Results of measurement led to basic reactor modifications and increased emphasis on substrate diffusion barrier research. DOE

N85-10848# Max-Planck-Inst. fuer Physik und Astrophysik, Munich (West Germany). Werner-Heisenberg-Inst. fuer Physik.
RECENT PROGRESS IN BGO DEVELOPMENT FOR HIGH RESOLUTION CALORIMETRY
Eckart Lorenz Jun. 1984 12 p refs
(MPI-PAE/Exp-E1-129) Avail: NTIS HC A02/MF A01

Production methods and performance characteristics of bismuth germanate for electromagnetic calorimetry are summarized. Commercial production of polycrystalline BGO for the meltstock now exists. Three production methods for crystal growth were developed. Results from test calorimeters confirm expectations for high energy resolution, but intrinsic numbers are missing. Very high electron to hadron separation is observed. Bismuth germanate shows self healing from radiation damage. Photodiode readout is an important alternative to photomultiplier readout. Author (ESA)

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N85-10849# Pennsylvania State Univ., University Park. Dept. of Mechanical Engineering.
OVERALL HEAT TRANSFER COEFFICIENTS FOR A HORIZONTAL CYLINDER IN A FLUIDIZED BED M.S. Thesis
A. M. Terpolilli Apr. 1984 62 p
(Contract N66314-70-A-0083)
(AD-A144878) Avail: NTIS HC A04/MF A01 CSCL 20/13

Total heat transfer coefficients were determined for a heated, copper cylinder placed horizontally in a fluidized bed. The fluidized particles were glass beads ranging in size from 215 micrometers to 3.40 mm. Fluidization was accomplished using air. Temperatures were measured using thermocouples and the resulting h values tabulated and plotted as a function of superficial velocity and relative velocity. Nusselt numbers based on particle diameter and tube wall diameter were also determined. The results show consistent patterns with other workers and are substantiated by empirical correlations. GRA

N85-10850# National Bureau of Standards, Washington, D.C. Thermophysics Div.
THERMODYNAMIC PROPERTIES OF ISOBUTANE-ISOPENTANE MIXTURES FROM -40 TO +600(0)F AND UP TO 1000 PSIA Interim Report
J. S. Gallagher, J. M. H. L. Sengers, G. Morrison, and J. V. Sengers Jul. 1984 129 p refs
(Contract DE-AI03-82SF-11653)
(DE84-015137; DOE/SF-11653/T11) Avail: NTIS HC A07/MF A01

The Helmboltz function for pure isobutane from a recent correlation was converted to a dimensionless form and a pressure enthalpy chart based on this function was generated by computer. A Helmholtz function for mixtures of isobutane and isopentane was formed based upon the dimensionless corresponding states principle. Scarce literature data for saturation properties of isopentane, and new data for its vapor pressure and for the critical line of the mixture, were used. The accuracy of the surface was checked by comparing with literature enthalpy data and with new VLE data for the mixture. Tables of thermodynamic properties were generated from this Helmholtz function for the 0.1 mole fraction isopentane-in-isobutane mixture in the single phase region and on the dew and bubble point curves, together with properties of the coexisting phase. A pressure enthalpy chart for this mixture was also generated. DOE

N85-10851# Kaiserslautern Univ. (West Germany). Fachbereich Mathematik.
THE BOLTZMANN EQUATION: GLOBAL EXISTENCE FOR A RARE GAS IN AN INFINITE VACUUM
Reinhard Illner and Marvin Shinbrot Feb. 1984 19 p refs Submitted for publication
(Grant NRC-A-8560)
(Preprint-78) Avail: NTIS HC A02/MF A01

It is proved that the Boltzmann equation has a unique solution, global in time, in all space. The conditions are: (1) that the initial data go to zero fast enough at infinity, and (2) that the mean free path is large enough. In the case of a finite volume of gas released into a infinite vacuum, results show that the corresponding solution of the Boltzmann equation exists globally if the gas is rare enough. The paradigm shows that infinity should be absorbing, and so it is. Under conditions (1) and (2), it is proved that all molecules are eventually swept out of any finite domain. Thus equilibrium is always trivial. Author (ESA)

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N85-10852# Pennsylvania State Univ., University Park.
DEVELOPMENT OF A PRODUCTION ORDER RELEASE METHODOLOGY Final Report, 1 Sep. 1983 - 31 May 1984
D. J. Medeiros Jul. 1984 34 p
(Grant AF-AFOSR-0333-83; AF Proj. 2304)
(AD-A145213; AFOSR-84-0726TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

The order release problem involves selecting subsets of available orders to release to the shop floor such that the system is utilized efficiently and queue time is reduced. A solution to this problem is proposed which combines Leontief flow models and linear programming in an iterative procedure. Examples of the approach are illustrated. Author (GRA)

N85-10853# National Science Foundation, Washington, D.C.
NATIONAL SCIENCE FOUNDATION, FISCAL YEAR 1983, VOLUME 1 Annual Report
Jun. 1984 132 p
(PB84-212315; NSF-84-1; AR-33) Avail: NTIS HC A07/MF A01 CSCL 05A

An annual report summarizing the results of scientific and engineering research supported by the Foundation during the past fiscal year is given. Also included are a statement by the NSF

Director and five appendixes (financial report, patents list, staff and advisory committee members, etc.). GRA

N85-10854# National Science Foundation, Washington, D.C.
NATIONAL SCIENCE FOUNDATION GRANTS AND AWARDS FOR FISCAL YEAR 1983, VOLUME 2 Annual Report
Jun. 1984 237 p 2 Vol.
(PB84-212323) Avail: NTIS HC A11/MF A01 CSCL 05A

A listing is provided, by subject area, of grants and awards (including fellowships for science and engineering education) made by NSF during the past fiscal year. Information on each grant or award includes the amount, recipient's name and institution, and the project supported. GRA

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N85-10855# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
OPTIMIZING SEARCH WITH POSITIVE INFORMATION FEEDBACK
Theodor J. Stewart Sep. 1983 27 p refs
(CSIR-TWISK-313) Avail: NTIS HC A03/MF A01

The design of search plans when positive information can be gained during the search regarding the target's location or movement, is considered. It is shown that rigorous maximization of detection probability is impracticable and unjustifiable. On the other hand, the information processing requirements are not difficult, which leads to a view of search planning as a statistical experimental design problem. In this context, a class of moving horizon rules is proposed. It is suggested that this approach is not merely convenient heuristic, but the more relevant practical search planning tool. Numerical examples illustrate that, even in the classical problem with no positive information feedback, a moving horizon rule can achieve 80 to 90% of the possible gain over myopic rules. A further example demonstrates that the experimental design approach can result in substantial gains in detection probability over the optimal plan which ignores the possibility of positive information feedback at the design stage. Author

N85-10856*# National Aeronautics and Space Administration, Washington, D. C.
DATA INPUT, PROCESSING AND PRESENTATION
H.-J. Langer Jul. 1984 55 p Transl. into ENGLISH of "Datenaufnahme, Verarbeitung und Darstellung" rept. Deutsche Forschungs und Versuchsanstalt fuer Raumfahrt eV, Brunswick, 1984 p 1-53 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77739; NAS 1.15:77739) Avail: NTIS HC A04/MF A01 CSCL 05B

The problems of data acquisition, processing and display are investigated in the case of a helicopter rotor balance. The types of sensors to be employed are discussed in addition to their placement and application in wind tunnel trials. Finally, the equipment for data processing, evaluation and storage are presented with a description of methods. Author

N85-10857# Department of Defense, Washington, D. C.
AUTOMATED DATA SYSTEMS (ADS) DOCUMENTATION STANDARDS
24 Apr. 1984 162 p
(AD-A144867; DOD-7935.1-STD) Avail: NTIS HC A08/MF A01 CSCL 09/2

These standards provide guidelines for the development and revision of the documentation for Automated Data Systems (ADS) or applications computer programs, and prescribe the standards and descriptions for technical document produced during the life cycle of an ADS. The standards give managers of ADS projects documentation of uniform formats and content for review; and ADS technicians with a standard record of technical information for coordination of later ADS development or use modification. The standards provide authority, purpose, scope, applicability and objective, as well as an organization and a numbering system. They also provide guidelines, general considerations and review procedures for the 11 types of ADS documents. Description and content of the 11 types of documents are also explained. GRA

N85-10858# Naval Postgraduate School, Monterey, Calif.
INFORMATION REQUIREMENTS ANALYSIS: AN APPLICATION M.S. Thesis
R. B. Renner Mar. 1984 425 p
(AD-A144896) Avail: NTIS HC A18/MF A01 CSCL 09/2

This research applied the methodology of Structured Systems Analysis to the information requirements of the Department of Administrative Sciences of the Naval Postgraduate School. It reviewed all flows of information to and from the Department and showed that even though, in the aggregate, the requirements seem amazingly complex, the analysis can be structured in a sensible, methodical system. The author also recommends several relational data bases and internal reports to support the Department's information requirements, as well as recommending that the analysis approach be adapted throughout the university. Author (GRA)

N85-10859# Naval Postgraduate School, Monterey, Calif.
DATA DICTIONARY SYSTEMS AND THEIR ROLE IN INFORMATION RESOURCE MANAGEMENT M.S. Thesis
D. L. Robertson Mar. 1984 93 p
(AD-A144905) Avail: NTIS HC A05/MF A01 CSCL 09/2

The explosive proliferation of computers has led to the increasing importance of developing and implementing various management concepts for effective and efficient operation and control. The complex data processing environment of today cannot be handled by hardware alone, but require an information system composed of hardware, software, data, personnel and procedures. The vast storage capabilities of modern equipment had led to the development of databases for more effective and efficient use of memory capacity. The increasing importance of software and the cost of developing and maintaining it demands more and better management, giving rise to the software life cycle concept. With the automation of the functions of an organization, data and information become critical organizational resources. Information Resource Management provides effective and efficient management and control of these information resources. A key component in this management and control is the Data Dictionary System. Author (GRA)

N85-10860# Stanford Univ., Calif. Dept. of Computer Science.
UPDATING LOGICAL DATABASES
R. Fagin (IBM, San Jose, Calif.), G. M. Kuper, J. Ullman, and M. Y. Vardi (IBM, San Jose, Calif.) 1984 15 p
(Grant AF-AFOSR-0212-80)
(AD-A144937; AFOSR-84-0712TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

The authors suggest a new approch to database updates, in which a database is treated as a collection of theories. They investigate two issues: simultaneous multiple update operations, and equivalence of databases under update operations. Author (GRA)

N85-10861# Stanford Univ., Calif. Dept. of Chemistry.
SET-THEORETIC PROBLEMS OF NULL COMPLETION IN RELATIONAL DATABASES Technical Report
A. M. Keller 1984 5 p
(Grant AF-AFOSR-0212-80)
(AD-A145045; AFOSR-84-0711TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

When considering using databases to represent incomplete

information, the relationship between two facts where one may imply the other needs to be addressed. In relational databases, this question becomes whether null completion is assumed. That is, does a (possibly partially-defined) tupe imply the existence of tuples that are less informative than the original tuple. We show that no relational algebra, that assumes equivalence under null completion, can include set-theoretic operators that are compatible with ordinary set theory. Author (GRA)

N85-10862# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
EG AND G IDAHO'S RESPONSE TO A REQUEST FOR A GRAPHIC DATA BASE SUPPORT PACKAGE
Pat Rafferty and Brian Adnerson Jun. 1984 27 p refs
(Contract DE-AC07-76ID-01570)
(DE84-015171; EGG-ED-6662) Avail: NTIS HC A03/MF A01

An overview of existing graphics and data acquisition capabilities along with some current thinking on a Modular Integrated Data Acquisition and Control System is provided. Experiences in the integration of the various acquisition, display and analysis packages are related as well. Applications described address enhancements to the existing Westinghouse Hanford Company system. DOE

N85-10863# Florida Univ., Gainesville. Database Systems Research and Development Center.
A TECHNIQUE TO MODEL AND DESIGN PHYSICAL DATABASE SYSTEMS
Timothy E. Wise Dec. 1983 105 p refs
(Contract DE-AS05-81ER-10977)
(DE84-015337; DOE/ER-10977/T6) Avail: NTIS HC A06/MF A01

Database management systems (DBMSs) allow users to define and manipulate records at a logical level of abstraction. A logical record is mapped into a collection of physical records. Physical records are stored in file structures managed by DBMS. Likewise, DBMS commands which appear to be directed toward one or more logical records actually correspond to a series of operations on the file structures. The structures and operations of DBMS (i.e., its physical architecture) are not visible to users at the logical level. Traditionally, logical records and DBMS commands are mapped to physical records and operations in one step. Logical records which are mapped to physical records in a series of steps over several levels of abstraction are described. Each level of abstraction is composed of one or more intermediate record types; a hierarchy of record types results that covers the gap between logical and physical records. The first step of the technique identifies the record types and levels of abstraction that describe a DBMS. The second step maps DBMS commands to physical operations in terms of these records and levels of abstraction. The third step encapsulates each record type and its operations into a programming construct called a module. The technique is applied to modeling existing DMBSs and designing the physical architectures of new DBMSs. To illustrate one application, the architecture of the commercial DBMS INQUIRE is described. DOE

N85-10864# Florida Technological Univ., Orlando. Dept. of Computer and Information Sciences.
VERTICAL COMPRESSION ALGORITHMS
D. S. Batory 1984 23 p refs
(Contract DE-AS05-81ER-10977)
(DE84-015040; DOE/ER-10977/T4) Avail: NTIS HC A02/MF A01

Two new vertical compression algorithms, VRE and HVRE, are presented. They are based on a combination of character matrix transposition (where rows are initially identified with records) and horizontal compression algorithms (run-length encoding and Huffman encoding). Experimental and theoretical results are presented that show the performance of VRE and HVRE is superior to that of some reputable commercial algorithms. Specifically, these are the compression algorithms of the ADABAS, IDMS and SHRINK/2 data management systems. The VRE ande HVRE algorithms are best suited for compressing statistical files which are sequentially processed and batch updated. They may also be used for file archival and for compressing randomly processed files as well. DOE

N85-10865# Fondazione Ugo Bordoni, Rome (Italy).
ATTENUATION EXPERIMENTAL DATA BANK IN THE COST 205 PROJECT. STRUCTURE AND MANAGEMENT OF THE FINAL SUPPORTS [BANCA DATI SPERIMENTALI DI ATTENUAZIONE NEL PROGETTO COST 205; STRUTTURA E GESTIONE DEI SUPPORTI FINALI]
Ermanno Fionda Mar. 1983 31 p refs In ITALIAN
(FUB-5-1983) Avail: NTIS HC A03/MF A01

The architecture of a COST attenuation data bank and the computation supports are described. The data are stored at three levels the original data sheets, magnetic disk file and magnetic tape file. The characteristics of each data support are detailed. A Data General Eclipse S/250 computer is used. The computer program is discussed. Author (ESA)

N85-10866# Institute for Perception RVO-TNO, Soesterberg (Netherlands). Experimental Psychology Group.
IMPROVING TECHNICAL DOCUMENTS
M. E. Noble Jun. 1984 25 p ref
(Contract A79/KL/059)
(AD-B084855; IZF-1984-23; TDCK-79371) Avail: NTIS HC A02/MF A01 CSCL 09/2

Guidelines for the preparation of technical documents are presented. Techniques for determining user needs, educational level, and pertinent experience are discussed. Presentation techniques, including prose material, flow charts, tables, and graphs, are assessed. Author (ESA)

N85-10867# General Accounting Office, Washington, D. C. Accounting and Financial Management Div.
DEPOSITORY LIBRARIANS' VIEWS ON GPO'S ADMINISTRATION OF THE DEPOSITORY LIBRARY PROGRAM. REPORT TO THE CHAIRMAN, JOINT COMMITTEE ON PRINTING
9 Apr. 1984 43 p
(PB84-212265; GAO/AFMD-84-50; B-214852) Avail: NTIS HC A03/MF A01 CSCL 05B

GAO studied the Governmental Printing Office's Depository Library Program in 1983 at the request of the Joint Committee on Printing. GAO sent a questionnaire to depository librarians as part of that effort. This report summarizes their responses. GRA

N85-10868# Environmental Protection Agency, Washington, D.C. Office of Library Systems Services.
EPA (ENVIRONMENTAL PROTECTION AGENCY) ENVIRONMENTAL DATA BASE AND MODEL DIRECTORY, VOLUME 1
Jul. 1983 63 p refs
(PB84-207562) Avail: NTIS HC A04/MF A01 CSCL 05B

Volume 1 of the EPA Environmental Data Base and Model Directory consists of the following indexes: Names of Data Bases, Names of Models, Index of Organizations, Names of Discontinued Data Bases, and Names of Discontinued Models. The brief description of data bases and models that appear within each of the indexes points to the specific page in Parts 1 and 2 of Volume 2 that contain a complete descriptive record of the data base or model. GRA

N85-10869# National Bureau of Standards, Washington, D.C. Information Resources and Services Div.
PUBLICATIONS OF THE NATIONAL BUREAU OF STANDARDS, 1983 CATALOG Report, Jan. - Dec. 1983
Rebecca J. Morehouse May 1984 457 p
(PB84-218031; NBS/SP-305-Suppl-15; LC-48-47112) Avail: NTIS HC A20/MF A01; also available SOD CSCL 05A

The 15th Supplement to Special Publication 305 lists the 1983 papers which reflect the results of National Bureau of Standards programs. Also included are those NBS papers published prior to 1983 but not reported in previous supplements of SP305. In addition to bibliographic data, key words, and abstracts for each publication

and/or paper, the catalog provides an author and key word index. GRA

N85-10382*# Arizona State Univ., Tempe. Dept. of Civil Engineering.
TEQUEL: THE QUERY LANGUAGE OF SADDLE
S. D. Rajan *In* NASA. Langley Research Center Res. in Struct. and Dyn., 1984 Oct. 1984 p 55-71 refs (For primary document see N85-10377 01-39)
Avail: NTIS HC A18/MF A01 CSCL 05B

N85-10671# Joint Publications Research Service, Arlington, Va.
DECENTRALIZED DATA ACQUISITION TO REMEDY EDP BOTTLENECK
In its East Europe Rept.: Sci. and Technol. (JPRS-ESA-84-030) 8 Aug. 1984 p 5-9 refs Transl. into ENGLISH from Radio Fernsehen Elektron. (East Berlin), v. 32, no. 1, 1983 p 8-11 (For primary document see N85-10670 01-60)
Avail: NTIS HC A03/MF A01

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

No abstracts in this category.

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N85-10670# Committee on Appropriations (U. S. Senate).
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT, AND CERTAIN INDEPENDENT AGENCIES APPROPRIATIONS FOR FISCAL YEAR 1985, PART 2
Washington GPO 1984 883 p Hearings on H. R. 5713 before a Subcomm. of the Comm. on Appropriations, 98th Congr., 2nd Sess., 1, 29 Mar., 12 Apr., and 1 May 1984
(S-Rept-98-889-Pt-2; GPO-31-248) Avail: Committee on Appropriations

Requests of $1,501,792,000 for the National Science Foundation, $7,491,400,000 for NASA, $630,072,000 for the Federal Emergency Management Agency, $67,428,000 for the Federal Home Loan Bank Board and $10,500,000,000 for the Housing and Urban Development are justified. Office Technology Assessment findings on automatic and the civilian space station are included. For individual titles, see N85-10871 through N85-10873.

N85-10671# Committee on Appropriations (U. S. Senate).
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
In its Department of Housing and Urban Development and Certain Independent Agencies for Fiscal Year 1985, Pt. 2 1984 p 1075-1241 Washington GPO (For primary document see N85-10870 01-84)
Avail: Committee on Appropriations

Appropriations for the space station; space transportation capability development; space science and applications; technology utilization; aeronautical research and technology; space research and technology; tracking and data advanced system; shuttle production and operational capability; space and ground networks, communication and data systems; and construction of facilities are detailed. B.G.

N85-10672# Committee on Appropriations (U. S. Senate). c18
OFFICE OF TECHNOLOGY ASSESSMENT
In its Department of Housing and Urban Development and Certain Independent Agencies Appropriations for Fiscal Year 1985, Pt. 2 1984 p 1233-1241 Washington GPO (For primary document see N85-10870 01-84)
Avail: Committee on Appropriations

Three major issues were addressed: how best to push toward more capable automated space systems and the wider use thereof; how to determine the optimum division of responsibility between people and machines; and how to estimate the importance of space automation to Earth applications. B.G.

N85-10673# Committee on Appropriations (U. S. Senate).
WORKSHOP ON AUTOMATED SPACE STATION
In its Department of Housing and Urban Development and Certain Independent Agencies for Fiscal year 1985, Pt. 2 1984 p 1243-1349 Washington GPO Workshop held in Washington, D.C., 18 Mar. 1984 (For primary document see N85-10870 01-84)
Avail: Committee on Appropriations

Topics on the space station discussed included: Earth based applications; automation and/or teleoperators to reduce the cost of space operations; robotics; man machine systems; satellite serving systems; design environment; adaptive control; automated trouble shooting; computer aided simulation; kinematics; sensing and communication; materials handling; astronaut experience; and cost factors. B.G.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

No abstracts in this category.

88 SPACE SCIENCES (GENERAL)

N85-10874*# National Aeronautics and Space Administration, Washington, D. C.
A BIBLIOGRAPHY OF PLANETARY GEOLOGY AND GEOPHYSICS PRINCIPAL INVESTIGATORS AND THEIR ASSOCIATES, 1983 - 1984
Nanci E. Witbeck, ed. (Geological Survey, Flagstaff, Ariz.) Oct. 1984 52 p
(NASA-TM-87361; NAS 1.15:87361) Avail: NTIS HC A04/MF A01 CSCL 03B

A compilation is given of selected bibliographic data specifically relating to recent publications submitted by principle investigators and their associates, supported through NASA's Office of Space Science and Applications, Solar System Exploration Division, Planetary Geology and Geophysics Program. Topics include the solar system, asteroids, volcanoes, stratigraphy, remote sensing, and planetary craters. R.J.F.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N85-10875# South African Astronomical Observatory, Cape Province.
SOUTH AFRICAN ASTRONOMICAL OBSERVATORY CIRCULARS, NO. 7
1983 112 p refs

(SAAOC-7; ISBN-0-7988-2675-4) Avail: NTIS HC A06/MF A01

Photometric and spectroscopic analysis of a variety of stellar observations are discussed. Topics of research include radial velocities of dwarf cepheids and delta scuti stars, E region star brightness, CaII emission star standards, globular cluster giants, and a survey of nearby red dwarf stars. For individual titles, see N85-10676 through N85-10686.

N85-10676# South African Astronomical Observatory, Cape Province.

FAST FOURIER TRANSFORM FOR UNEQUALLY SPACED DATA

L. A. Balona *In its* South African Astron. Observ. Circ., No. 7 1983 p 1-11 refs (For primary document see N85-10875 01-89)
Avail: NTIS HC A06/MF A01

An algorithm is derived for the Fourier transform of unequally spaced data which does not require the calculation of trigonometric functions, but only the sums of two products. Consequently the speed of execution of the transform is much greater than in the usual method of approximate least squares. The algorithm is compared with the conventional one using artificial and real data. It is shown that the two methods are comparable in sensitivity and resolving power. Author

N85-10677# South African Astronomical Observatory, Cape Province.

OBSERVATIONS OF FOUR BETA CEPHEI STARS IN NGC6231

L. A. Balona and R. R. Shobbrook (Sydney Univ.) *In its* South African Astron. Observ. Circ., No. 7 1983 p 12-18 refs (For primary document see N85-10875 01-89)
Avail: NTIS HC A06/MF A01

Observations of four Beta Cephei variables in the very young open cluster NGC6231 are presented. The observations are made through the Johnson B filter using 0.5, 1.0m and 0.6 reflectors. Transparency variations are monitored by observing two or three comparison stars in the cluster itself. The four program stars (Seggewis nos 110, 150, 253 and 261) and the comparison stars (Seggewis nos 112, 248 and 287) are observed in sequence throughout the night in such a way that each program star is flanked by observations of a comparison star. The comparison star S248 is the most reliable standard. A small systematic difference exists between the data of the two observatories, presumably due to differences in effective wavelength of the filters. Corrections of +0.90 and -1.60 millimagnitudes are added to the data of the authors data. M.A.C.

N85-10678# South African Astronomical Observatory, Cape Province.

SIMULTANEOUS PHOTOMETRY AND RADIAL VELOCITIES OF DWARF CEPHEIDS AND DELTA SCUTI STARS

L. A. Balona and R. S. Stobie (Royal Observatory, Edinburgh) *In its* South African Astron. Observ. Circ., No. 7 1983 p 19-35 refs (For primary document see N85-10875 01-89)
Avail: NTIS HC A06/MF A01

Simultaneous photometry and photoelectric radial velocities are presented for the dwarf cepheids VZ Cnc, AD CMi, V703 Sco and for the delta Scuti stars V743 Cen and Rho Pup. Data are presented in tabular form. R.S.F.

N85-10679# South African Astronomical Observatory, Cape Province.

UBV PHOTOMETRY OF E REGION STANDARD STARS OF INTERMEDIATE BRIGHTNESS

A. W. J. Cousins *In its* South African Astron. Observ. Circ., No. 7 1983 p 36-46 refs (For primary document see N85-10875 01-89)
Avail: NTIS HC A06/MF A01

Photometry data are given for 335 stars in the nine E regions. Observations were made using a photometer and filters on the 47 cm reflector at Cape Town. The stellar dispersions are summarized. Data are presented in tabular form. R.S.F.

N85-10680# South African Astronomical Observatory, Cape Province.

UBV PHOTOMETRY OF E REGION STARS: SOME INTERCOMPARISONS

A. W. J. Cousins *In its* South African Astron. Observ. Circ., No. 7 1983 p 47-54 refs (For primary document see N85-10875 01-89)
Avail: NTIS HC A06/MF A01

Material to improve the UBV photometry of E-region standard stars and various series was intercompared to look for systematic differences It is concluded that the internal standard errors of the new mean values are + or 0 to m power .001 or + or 0 to m power .002 for V and B-V and + or - 0 to m power .003 for U-B for stars brighter than V = 9.0, and slightly larger for fainter stars. E.A.K.

N85-10681# South African Astronomical Observatory, Cape Province.

OBSERVATIONS OF THE O-TYPE SUBDWARF ECLIPSING BINARY SYSTEM LB 3459 (AA DOR)

David Kilkenny *In its* South African Astron. Observ. Circ., No. 7 1983 p 55-69 refs (For primary document see N85-10875 01-89)
Avail: NTIS HC A06/MF A01

Over 500 observations of LB 3459 in the ubvy and VRI systems are presented together with over 300 V-magnitude observations. The distance of this eclipsing system is estimated to be 230 pc. E.A.K.

N85-10682# South African Astronomical Observatory, Cape Province.

OBSERVATIONS OF THE PULSATING HYDROGEN- DEFICIENT STAR BD+13 DEG 3224, DURING 1980 - 1981

David Kilkenny *In its* South African Astron. Observ. Circ., No. 7 1983 p 70-81 refs (For primary document see N85-10875 01-89)
Avail: NTIS HC A06/MF A01

Observations of BD+13 deg 3224 in the uvby and VRI sub c system are presented together with over 500 V or y magnitude observations made in the period 1980 August to 1981 August. A mean light curve is derived and the Barnes-Evans relation is used to estimate the radius from the VRI sub C photometry. E.A.K.

N85-10683# South African Astronomical Observatory, Cape Province.

LOCAL PHOTOMETRIC STANDARDS FOR CaII EMISSION STARS

T. Lloyd Evans, M. C. J. Koen, and A. A. Hultzer *In its* South African Astron. Observ. Circ., No. 7 1983 p 82-85 refs (For primary document see N85-10875 01-89)
Avail: NTIS HC A06/MF A01

UBV data are given for 108 stars which are suitable local standards for 52 stars with strong Ca2 emissions. An additional eight stars were rejected as possible standards because of suspected variability. Author

N85-10684# South African Astronomical Observatory, Cape Province.

PHOTOELECTRIC PHOTOMETRY OF GLOBULAR CLUSTER GIANTS

T. Lloyd Evans *In its* South African Astron. Observ. Circ., No. 7 1983 p 86-95 refs (For primary document see N85-10875 01-89)
Avail: NTIS HC A06/MF A01

Photoelectric V, (V-I) sub KC photometry is presented for 261 stars in 10 galactic globular clusters; UBV photometry of 54 stars in 5 clusters is also given. Sources of error are discussed and a comparison is made with published photometry of some of these stars on the UBVI sub K system. Author

N85-10685# South African Astronomical Observatory, Cape Province.

SPECTROSCOPIC DATA FOR GLOBULAR CLUSTER GIANTS. 1: STARS OF THE RED GIANT TIP

T. Lloyd Evans *In its* South African Astron. Observ. Circ., No. 7 1983 p 96-105 refs (For primary document see N85-10875 01-89)
Avail: NTIS HC A06/MF A01

Two hundred and sixty-one photographic spectra of 156 globular cluster giants, including 47 variables, and 6 field stars

have been taken at a disperson of 60 A/mm. The intensities of the strong features Mgb, NaD and TiO bands have been measured where possible; H alpha or H beta have been measured in a few stars for which suitable spectra are available. Measurements of NaD, TiO and H alpha have also been made for a few stars at 44 A/mm or 60 A/mm using the IPCS detector. These confirm the reliability of the photographic measurements and permit an estimate of the random errors. Author

N85-10886# South African Astronomical Observatory, Cape Province.
A SPECTROSCOPIC SURVEY OF 113 NEARBY RED DWARF STARS
Alistair R. Walker *In its* South African Astron. Observ. Circ., No. 7 1983 p 106-109 refs (For primary document see N85-10875 01-89)
Avail: NTIS HC A06/MF A01

A spectroscopic survey of nearby red dwarf stars has been undertaken with the primary objective of searching for flare stars, which would be expected to have H alpha in emission. A by-product of this survey has been the classification of the stars on the revised MK system and the identification of possible subdwarfs. The candidate stars were chosen from the list of stars with proper motion greater than 1 arc sec per year and V magnitude brighter than 15 with the additional requirements that the stars be south of declination 0 deg and have R-I > 0.65. The latter essentially excludes all stars with spectral type earlier than K7. A few extra stars were also observed, most of these being stars with MK classifications. B.W.

N85-10887*# National Aeronautics and Space Administration, Washington, D. C.
THE CATALOGUE OF THE DISCRETE SOURCES IN THE DECLINATION RANGE FROM -13 DEG TO -2 DEG
S. Ya. Braude, A. P. Miroshnitchenko, K. P. Sokolov, and N. K. Sharykin Aug. 1984 51 p refs Transl. into ENGLISH of "Katalog diskretnykh istochnikov v intervale skloneniye ot -13 deg do -2 deg" rept. Pr-147 Kharkov, 1980 51 p Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Inst. of Radiophysics and Electronics, Academy of Sciences of the Ukrainian SSR, Kharkov
(Contract NASw-3511)
(NASA-TM-77594; NAS 1.15:77594; Pr-147) Avail: NTIS HC A04/MF A01 CSCL 03A

The results of the discrete source measurements with declinations -13 deg < or = delta < or = -2 deg and right ascensions 0 sub h + 24 sub h are given and were obtained as part of the systematic decametric survey of the celestial sphere with the rotatiotelescope UTR-2. Three hundred sixteen sources were found in the given declination range, four of which were observed for the first time. The source coordinates measured in the survey were compared with those from the 4th Cambridge survey at 178 MHz and the Parkes survey at 408 MHz. Author

N85-10888*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
OPTICAL ANALYSIS OF THE STAR-TRACKER TELESCOPE FOR GRAVITY PROBE
D. E. Zissa Oct. 1984 23 p
(NASA-TM-86474; NAS 1.15:86474) Avail: NTIS HC A02/MF A01 CSCL 03A

A ray tracing modeling of the star tracker telescope for Gravity Probe was used to predict the character of the output signal and its sensitivity to fabrication errors. In particular, the impact of the optical subsystem on the requirement of 1 milliarc second signal linearity over a + or - 50 milliarc second range was examined. Photomultiplier and solid state detector options were considered. Recommendations are made. Author

N85-10889# Max-Planck-Inst. fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
STUDY OF A CODED MASK TELESCOPE FOR ASTRONOMICAL MEASUREMENTS IN THE HARD X-RAY DOMAIN [UNTERSUCHUNGEN AN EINER KODIERTEN LOCHKAMERA FUER ASTROMONISCHE MESSUNGEN IM HARTEN ROENTGENBEREICH]
Frank Haberl May 1984 99 p refs In GERMAN
(MPE-182; ISSN-0340-8922) Avail: NTIS HC A05/MF A01

A coded mask telescope was investigated for balloon flights, and sensitivity studies of a rotation-modulation collimator system were carried out. An Anger camera with a spatial resolution of 8 to 10 mm was built for the telescope. The mask coding theory and mask construction are described. A correlation method is used for image evaluation. The effects of detector characteristics on the correlation image are determined. The efficiency of the correlation method is found to depend on the detector spatial resolution. Measurements on a laboratory model show a measuring accuracy of 0.1 deg and a correlation efficiency conforming to values found by simulations. The efficiency decreases with source energy as expected. Simulation shows that the collimator-induced shift in source position at the boundary of the image can be corrected. The coded mask telescope does not require a precise alignment of the telescope axis, and is four times more sensitive than the rotation-modulation collimator. The telescope is very well suited for measurements on weak X-ray sources. Author (ESA)

N85-10890# Max-Planck-Inst. fuer Radioastronomie, Bonn (West Germany).
TEST MEASUREMENTS OF THE 100 m TELESCOPE AT LAMBDA = 7 mm
W. J. Altenhoff and J. E. Wink 1984 23 p refs
(TR-18) Avail: NTIS HC A02/MF A01

Surface quality of a radio telescope was tested in its original state, adjusted and optimized for zenith position; adjusted for intermediate elevation, using the calculation for the homologous deformation with elevation to extrapolate from the adjustment at zenith; after exchange of the sandwich type panels; and after surface adjustment according to holographic measurements. Tests show that after readjustment the telescope, for a limited elevation range (20 to 50 deg) can observe easily down to 3 mm. With an adjustable shape subreflector, the total elevation range for secondary focus observations could be used. Readjustment beyond 60 m, to use an illumination of 75 m for all receivers between 1.5 and 0.7 cm is advocated. Author (ESA)

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N85-10891# Bielefeld Univ. (West Germany). Zentrum fuer interdisziplinaere Forschung.
DEFORMATIONS OF TWO-DIMENSIONAL DISSIPATIVE MAPS
R. Vilela Mendes (Inst. Nacional de Investigation Cientifica, Lisbon, Portugal) 1984 41 p refs
(Rept-69) Avail: NTIS HC A03/MF A01

Necessary and sufficient conditions are obtained for persistency under analytic perturbations of orbits of the dissipative integrable map yn+1 = yn xn+1 = bxn + yn (mod. 1), b <1. An analytical numerical study of constant Jacobian maps of the 2-torus is performed to check the range of applicability of the deformation stability criteria, and to test the criteria and the deformation ideas in domains where it is not proven they can apply. Focusing evolution is treated, and it is suggested that large scale stochastic regimes can be interpreted as deformations of exactly solvable strongly dissipative systems. Author (ESA)

N85-10892# Bielefeld Univ. (West Germany). Zentrum fuer interdisziplinaere Forschung.
REDUCTION OF NONLINEAR PROBLEMS TO SCHROEDINGER OR HEAT EQUATIONS: FORMATION OF KEPLER ORBITS, SINGULAR SOLUTIONS FOR HYDRODYNAMICAL EQUATIONS
S. Albeverio (Ruhr Univ.), Ph. Blanchard, and R. Hoegh-Krohn (Universite de Provence, Marseille) Apr. 1984 21 p refs

Submitted for publication Sponsored by Deutsches Forschungsgemeinschaft and NAVT, Norway
(Rept-72) Avail: NTIS HC A02/MF A01

A Newtonian diffusion model is applied to the formation of planetary orbits. A Navier-Stokes dissipative equation, whose solutions can be found by reduction to the linear heat equation by a transformation for going from the nonlinear equations for stochastic velocities (equivalent to the stochastic equation for the position process) to the Schroedinger equation for the quantities associated with the distribution of the process, is outlined. The solutions give velocity fields which are singular on the nodal surfaces of the solutions of the heat equation. Author (ESA)

N85-10893# Bielefeld Univ. (West Germany). Zentrum fuer Interdisziplinaere Forschung.
TRAPPING FOR NEWTONIAN DIFFUSION PROCESSES
Ph. Blanchard 1984 26 p refs Presented at 23rd Intern. Universitaetswochen fuer Kernphys., Schladming, West Germany, 20 Feb. - 1 Mar. 1984 Sponsored by Deutsches Forschungsgemeinschaft and NAVF, Norway
(Rept-73) Avail: NTIS HC A03/MF A01

A mechanism for the formation of impenetrable barriers for Newtonian diffusion processes is considered. A mean stochastic acceleration for diffusion processes is defined. The Newtonian law in the mean acts as a constraint and enables probability distributions of the stochastic diffusion process to be constructed. It is shown that nodal surfaces can also be impenetrable barriers, splitting the family of typical particles into several groups. Since no particle can pass from one group to another, a segregation (confinement, trapping) mechanism is created. Application of the mechanism to formation of jet streams in the protosolar nebula; zonal wind structure of planetary atmospheres; and formation of the Van Allen belts are discussed. Author (ESA)

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N85-10894*# National Aeronautics and Space Administration, Washington, D. C.
GIACOBINI-ZINNER COMET: POLARIMETRIC AND PHYSICAL OBSERVATIONS
Marie-Therese Martel, P. Maines, S. Grudzinska, and A. Stawikowski Oct. 1984 19 p refs Transl. into ENGLISH from Ann. d'Astrophys. (France), v. 23, no. 3 and no. 5, 1960 p 498; 788-796 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-77771; NAS 1.15:77771) Avail: NTIS HC A02/MF A01 CSCL 03B

The results of observations of the Giacobini-Zinner comet on 25 and 31 October 1959 are presented. The magnitude of the comet was measured photoelectrically in two spectral regions. The radius is on the order of one kilometer. The photoelectric measurements of comets 1959b and 1957c were used to measure the abundances of the CN and C2 radicals and of solid particles in the heads. Author

N85-10895*# National Aeronautics and Space Administration, Washington, D. C.
MICROTEKTITE DISCOVERED IN BEIJING
Li Dingrong, Wang Ande, Xie Zhenzhao, Wang Wanzhen, Liu Qingsi, Fei Jingxian, and Huang Yuzhu Jun. 1983 4 p Transl. into ENGLISH from Kexue Tongbao (China), v. 26, no. 4, 1981 p 128
(NASA-TM-77765; NAS 1.15:77765) Avail: NTIS HC A02/MF A01 CSCL 03B

The discovery, testing, and chemical composition of tiny vitreous spheres are discussed. These spheres, found in China, are thought to be microtektites. A method for determining the age of these spheres is mentioned. R.S.F.

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N85-10896*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ESTIMATING SUNSPOT NUMBER
Robert M. Wilson, Edwin J. Reichmann, and Dieter L. Teuber (Teledyne Brown Engineering, Huntsville, Ala.) Oct. 1984 24 p refs
(NASA-TM-86471; NAS 1.15:86471) Avail: NTIS HC A02/MF A01 CSCL 03B

An empirical method is developed to predict certain parameters of future solar activity cycles. Sunspot cycle statistics are examined, and curve fitting and linear regression analysis techniques are utilized. R.S.F.

N85-10897*# Stanford Univ., Calif. Center for Space Science and Astrophysics.
STRUCTURE AND EVOLUTION OF THE LARGE SCALE SOLAR AND HELIOSPHERIC MAGNETIC FIELDS Ph.D. Thesis
J. T. Hoeksema Apr. 1984 232 p
(Contract NAS5-24420; Grant NGR-05-020-599; Contract N00014-76-C-0207; Grant NSF ATM-77-20580)
(NASA-CR-175268; NAS 1.26:175268; AD-A144990; SU-CSSA-ASTRO-84-07) Avail: NTIS HC A11/MF A01 CSCL 03B

Structure and evolution of large scale photospheric and coronal magnetic fields in the interval 1976-1983 were studied using observations from the Stanford Solar Observatory and a potential field model. The solar wind in the heliosphere is organized into large regions in which the magnetic field has a componenet either toward or away from the sun. The model predicts the location of the current sheet separating these regions. Near solar minimum, in 1976, the current sheet lay within a few degrees of the solar equator having two extensions north and south of the equator. Soon after minimum the latitudinal extent began to increase. The sheet reached to at least 50 deg from 1978 through 1983. The complex structure near maximum occasionally included multiple current sheets. Large scale structures persist for up to two years during the entire interval. To minimize errors in determining the structure of the heliospheric field particular attention was paid to decreasing the distorting effects of rapid field evolution, finding the optimum source surface radius, determining the correction to the sun's polar field, and handling missing data. The predicted structure agrees with direct interplanetary field measurements taken near the ecliptic and with coronameter and interplanetary scintillation measurements which infer the three dimensional interplanetary magnetic structure. During most of the solar cycle the heliospheric field cannot be adequately described as a dipole. GRA

N85-10898# California Univ., San Diego, La Jolla. Center for Astrophysics and Space Sciences.
STUDIES OF SOLAR FLARES AND CORONAL LOOPS Final Scientific Report, 1 Feb. 1982 - 31 May 1984
R. C. Canfield 10 Jul. 1984 241 p
(Grant AF-AFOSR-0092-82)
(AD-A145009; UCSD-SP-84-21; AFOSR-84-0719TR) Avail: NTIS HC A11/MF A01 CSCL 03/2

The objectives of this research were to improve our understanding of solar flares and solar coronal loops. The specific approach to the flare objective was to analyze and interpret solar flare data, using theoretical methods developed as part of the research. The specific approach to the coronal loop objective was to investigate their thermal and magnetohydrodynamic stability for various physical models. The principal result of the flare research

was to demonstrate that, in two well observed flares, the mechanism of chromospheric evaporation accounts for the observed amount of flare X-ray plasma. The dominant energy transport mechanism is thermal conduction. Heating by energetic electrons is of secondary importance. The principal results of the magnetohydrodynamic stability analyses were demonstrations by the role of radiative energy loss, compressibility, magnetic field line twist, foot point magnetic field line tying, and radial plasma pressure gradient. GRA

N85-10899# Brookhaven National Lab., Upton, N. Y.
REPORT ON SOLAR NEUTRINO EXPERIMENTS
R. Davis, Jr., B. T. Cleveland, and J. K. Rowley 1984 14 p refs Presented at the Conf. on the Intersect. between Particle and Nucl. Phys., Steamboat Springs, Colo., 23 May 1984
(Contract DE-AC02-76CH-00016)
(DE84-014567; BNL-34995; CONF-8405193-28) Avail: NTIS HC A02/MF A01

The status of solar neutrino research that includes results of the Brookhaven chlorine detector, a discussion of the development of the gallium, bromine, and lithium radiochemical detectors, and some proposals for direct counting detectors is given. The gallium and bromine radiochemical detectors were developed and are capable of giving critical information of interest about neutrino physics and the fusion reactions in the interior of the Sun. A plan for building these detectors is outlined and a rough cost estimate is given. The plans in the Soviet Union for solar neutrino research are reviewed. DOE

N85-10900# National Geophysical Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 477, MAY 1984. PART 2: (COMPREHENSIVE REPORTS). DATA FOR NOVEMBER 1983, JULY 1981 AND MISCELLANEA. EXPLANATION OF DATA REPORTS ISSUED AS NUMBER 474 (SUPPLEMENT) FEBRUARY 1984
Helen E. Coffey, ed. May 1984 92 p 2 Vol.
(PB84-225036; SGD-477-Pt-2; NOAA-84072316-Pt-2;
LC-79-640375-Pt-2) Avail: NTIS HC A05/MF A01 CSCL 03B

Contents: (solar radio bursts at fixed frequencies; mass ejections from the Sun); solar flares; (interplanetary solar wind data, solar X-ray radiation from GOES5). GRA

N85-10901# National Geophysical Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 477, MAY 1984. PART 1: (PROMPT REPORTS). DATA FOR APRIL 1984, MARCH 1984 AND LATE DATA. EXPLANATION OF DATA REPORTS ISSUED AS NUMBER 474 (SUPPLEMENT) FEBRUARY 1984
Helen E. Coffey, ed. May 1984 140 p 2 Vol.
(PB84-225028; SGD-477-Pt-1; NOAA-84072315-Pt-1;
LC-79-640375-Pt-1) Avail: NTIS HC A07/MF A01 CSCL 03B

Data for April include: IUWDS alert periods (advance and worldwide), solar activity indices, solar flares, solar radio emission, inferred interplanetary magnetic field polarity, mean solar magnetic field, and Boulder geomagnetic substorm log. Data for March include: solar active regions, sudden ionospheric disturbances, solar radio spectral observations, cosmic ray measurements by neutron monitor, geomagnetic indices, radio propagation indices. Late data include: geomagnetic indices, daily calcium place index, Pioneer 12 interplanetary magnetic field magnitudes. GRA

93 SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N85-10902# Naval Research Lab., Washington, D. C.
COSMIC RAY EFFECTS ON MICROELECTRONICS. PART 3: PROPAGATION OF COSMIC RAYS IN THE ATMOSPHERE
C. H. Tsao, R. Silberberg, J. H. Adams, Jr., J. R. Letaw, and E. O. Hulburt 9 Aug. 1984 74 p
(RR0-3406)
(AD-A145026; AD-E401205; NRL-MR-5402) Avail: NTIS HC A04/MF A01 CSCL 04/1

Cosmic-ray nuclei that enter the atmosphere will subsequently breakup into lighter nuclei due to collisions with air particles. They also undergo a gradual loss of energy due to ionization. The fluxes and energy spectra of particles were calculated for several atmospheric depths and geomagnetic locations. The results of these radiation transport calculations are plotted as integral Linear Energy Transfer (LET) spectra showing the total number of particles that can contribute to energy lows in silicon above a given threshold value. The results can then be used to calculated the upset rate induced by cosmic ray nuclei for devices of known size and critical charge. Topics examined include: geomagnetic cutoff, soft upsets, and single event upsets. GRA

N85-10903# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
INTERPLANETARY COSMIC RAY INTENSITY: 1972-1984 AND OUT TO 32 AU Progress Report
J. A. VanAllen and B. A. Randall Aug. 1984 63 p
(Contract N00014-76-C-0016)
(AD-A145130; U-OF-IOWA-84-19) Avail: NTIS HC A04/MF A01 CSCL 04/1

Using a number of Geiger-Mueller tubes in the University of Iowa instruments on Pioneer 10 and Pioneer 11, we have measured the interplanetary intensity of cosmic rays E sub P $>$ 80 meV) over a complete solar activity cycle and out to a heliocentric distance of over 32 AU. Free space values of the background corrections due to the radioisotope thermal generators were determined during passage of Pioneer 11 under the dense rings of Saturn during the 1 September 1979 encounter. These improved corrections and ones inferred therefrom for Pioneer 10 have supplanted earlier estimates and have been applied to all data. GRA

N85-10904# Brookhaven National Lab., Upton, N. Y.
THE SEARCH FOR PROTON DECAY: INTRODUCTION
Maurice Goldhaber 26 Feb. 1984 4 p ref Presented at the 19th Recontre de Moriond on Electroweal Interactions and Unified Theories, La Plaque, France, 26 Feb. - 4 Mar. 1984
(Contract DE-AC02-76CH-00016)
(DE84-014349; BNL-34910; CONF-840280-9) Avail: NTIS HC A02/MF A01

In interpreting contained events observed in various proton decay detectors one can sometimes postulate, though usually not unambiguously, a potential decay mode of the proton, called a candidate. It is called a candidate, because for any individual event it is not possible to exclude the possibility that it is instead due to cosmic ray background, chiefly atmospheric neutrinos. Some consistency checks are proposed which could help establish proton decay, if it does occur in the presently accessible lifetime window. DOE

99 GENERAL

N85-10905# Southampton Univ. (England). Inst. of Sound and Vibration Research.
[HIGHLIGHTS OF THE INSTITUTE OF SOUND AND VIBRATION RESEARCH] Annual Report
Mar. 1984 47 p
Avail: NTIS HC A03/MF A01

Structures and machinery; fluid dynamics and accoustics; automotive engineering; audiology and human factors; and data analysis are presented. Publications for each area are listed. B.G.

N85-10906# National Research Council of Canada, Ottawa (Ontario). Associate Committee on Space Research.
CANADA REPORT TO COSPAR

Jul. 1984 80 p refs Presented at 25th Plenary Meeting, Graz, Jul. 1984
Avail: NTIS HC A05/MF A01

Space research at both governmental departments and universities is discussed. Space research and space policy at each government program and each university program is outlined. The exchange and development of ideas in space science by people representing geographic and disciplinary interest from all across Canada is presented. E.R.

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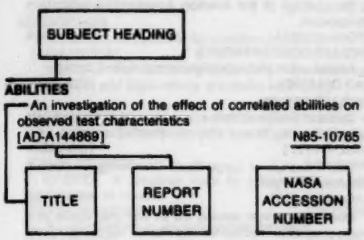

The subject heading is the key to the subject content of the document. Titles, report numbers, and accession numbers of pertinent documents are provided under each subject heading. When the title is insufficiently descriptive of the document content, a title extension has been added, separated from the title by three hyphens. The report number helps to indicate the type of document cited (e.g., NASA report, NASA translation, NASA contractor report). The NASA accession number is the number by which the document abstracts are arranged in this journal and by which the document is sold or requested. The titles, with title extensions if present, are arranged under each subject heading in ascending accession number order. The subject headings have been selected from the latest revision of the *NASA Thesaurus* (NASA SP-7051).

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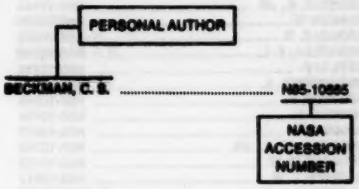

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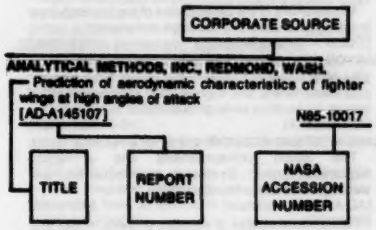

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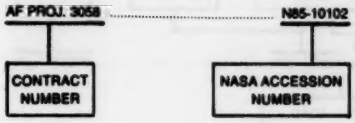

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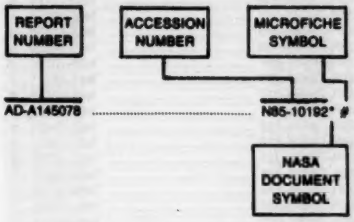

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